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Report on Active and Planned Spacecraft and Experiments

February 1985

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REPORT ON ACTIVE AND PLANNED SPACECRAFT AND EXPERIMENTS

Edited by

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National Space Science Data Center

February 1985

National Space Science Data Center (NSSDC)/
World Data Center A for Rockets and Satellites (WDC-A-R&S)
National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

PREFACE

The *Report on Active and Planned Spacecraft and Experiments* provides the professional community with information on current as well as planned spacecraft activity in a broad range of scientific disciplines. All scientific spacecraft (including both free-flying and Shuttle-attached payloads) that were active at some time during the period June 1, 1983, to September 30, 1984 or later, are included in the active section of this catalog, and those that were in an advanced planning stage or were approved as of approximately September 30, 1984, are included in the planned section. The performance information for active NASA and NASA-cooperative programs is based, to a large extent, on the project office status information through September 30, 1984. In addition, the National Space Science Data Center (NSSDC) has made use of information from other sources to make this report as accurate and up-to-date as possible.

The cooperation of numerous scientific staff members at NSSDC in obtaining information and writing/updating the spacecraft and experiment descriptions for this report is much appreciated. The Technical Editors have received significant help from the following NSSDC scientific staff members: H. Kent Hills, Richard Horowitz, John E. Jackson, Joseph H. King, Carolyn Y. Ng, Raghavingar Parthasarathy, E. Howard Scott, G. Richard Stonesifer, and James I. Vette. Special thanks are given to Susan Carrigan and Patricia A. Ross for their help with the information management system. The cooperation of the project offices and experimenters in supplying current documentation of their spacecraft and experiments is gratefully acknowledged. We are particularly pleased with the many constructive comments and corrections we have received from interested users of this report.

Norman J. Schofield, Jr.
Technical Editor

Ronald G. Littlefield
Technical Editor

Mary F. Elsen
Publications Editor

February 1985

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*For a complete listing of the spacecraft and experiments described in these sections, please refer to the "Index of Active and Planned Spacecraft and Experiments" (Section 4).

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INTRODUCTION

1. INTRODUCTION

1.1 Purpose

This report provides the professional community with information on current and planned spacecraft activity (including both free-flying spacecraft and Shuttle-attached payloads) for a broad range of scientific disciplines. By providing a brief description of each spacecraft and experiment as well as its current status, it is hoped that this document will be useful to many people interested in the scientific, applied, and operational uses of the data collected. Furthermore, for those investigators who are planning or coordinating future observational programs employing a number of different techniques such as rockets, balloons, aircraft, ships, and buoys, this document can provide some insight into the contributions that may be provided by orbiting instruments.

1.2 Contents

This document includes information concerning active and planned spacecraft and experiments. The information covers a wide range of scientific disciplines: astronomy, earth sciences, meteorology, planetary sciences, aeronomy, particles and fields, solar physics, life sciences, and material sciences. These spacecraft projects represent the efforts and funding of individual countries as well as cooperative arrangements among different countries.

Descriptions of navigational and communications satellites are specifically not included here. Also not given are descriptions of spacecraft that contain only continuous radio beacons used for ionospheric studies. Many of these spacecraft are listed in the *SPACEWARN Bulletin**. No attempt has been made to present information regarding classified spacecraft or experiments.

1.3 Organization

This report has two major sections which describe active and planned spacecraft and experiments. These two parts were generated from the National Space Science Data Center (NSSDC) automated information files and are each introduced by descriptive material.

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*The *SPACEWARN Bulletin* is prepared by the World Data Center A for Rockets and Satellites, Code 630.2, Goddard Space Flight Center, Greenbelt, MD 20771, USA. It is intended to serve as an international communications mechanism for the rapid distribution of information on satellites and space probes. It is published on behalf of the Committee on Space Research (COSPAR) by the International URSIGRAM and World Days Service (IUWDS), a permanent service of the International Scientific Radio Union in association with the International Astronomical Union and the International Union for Geodesy and Geophysics.

The first major part of this report, Section 2 - "Descriptions of Active Spacecraft and Experiments," is a listing of descriptions of all scientific spacecraft and experiments that were active at some time during the period June 1, 1983, to September 30, 1984, or later. The listing is arranged by spacecraft common name, and the investigations are listed under each spacecraft by the last name of the principal investigator, lead investigator, or team leader.

The second major part, Section 3 - "Descriptions of Planned Spacecraft and Experiments," contains descriptions of the scientific spacecraft and experiments that were proposed or approved for missions as of September 30, 1984, for which experiments or investigations have been selected, and for which NSSDC has at least minimal documentation.

Sections 4 and 5 are indexes to the information presented in Sections 2 and 3. Section 4, the "Index of Active and Planned Spacecraft and Experiments," is an alphabetical listing by spacecraft, including both common and alternate names, of all active and planned spacecraft and experiments. Investigations are listed under each spacecraft by the last name of the principal investigator, lead investigator, or team leader. This listing serves as an index to the location of spacecraft and experiment descriptions and includes launch dates and current status-of-operation data. Section 5, the "Investigator Name Index," is a listing, ordered by last name, of the scientific investigators associated with the experiments, and also gives each investigator's current affiliation.

Other relevant spacecraft, experiment, and personnel information is presented in Appendixes A through D. Appendix A lists some scientific spacecraft which are relevant to the purpose of this report but which are not described in Sections 2 or 3. Special investigations and groups of investigators for some missions that could not be presented conveniently in Sections 2 or 3 are listed in Appendix B. Certain words and phrases which are used in this report with specific meanings are defined in Appendix C. Appendix D is a listing of the meanings of certain abbreviations/acronyms used by NSSDC, a subset of which is used frequently in this document.

1.4 Document Availability

Upon request, NSSDC will provide copies of this report to individuals or organizations resident in the United States. The report is available to persons outside the United States through the World Data Center A for Rockets and Satellites (WDC-A-R&S). The official addresses for requests are printed on the inside front cover.

Recipients are requested to inform potential users of the availability of this report. Because of continuing costs involved in publishing a document of this size on a periodic basis, NSSDC encourages individuals located at the same organization to share this document.

1.5 Request for Additions/Corrections

NSSDC continually strives to increase the usefulness of this report by improving the spacecraft and experiment descriptions and by including additional spacecraft and experiments as they become known to NSSDC. This report is complete and reasonably accurate concerning NASA and NASA-cooperative programs; however, some descriptions of other spacecraft and experiments may be incomplete. It should be noted that the information concerning planned spacecraft and experiments is frequently general in nature and subject to change.

NSSDC would welcome comments about any appropriate additions or corrections to this report. Recommendations regarding its overall contents and organization would be appreciated also. In particular, it is hoped that principal experimenters, project offices, and other individuals or agencies will cooperate in bringing such matters to NSSDC's attention.

2

DESCRIPTIONS OF ACTIVE SPACECRAFT AND EXPERIMENTS

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2. DESCRIPTIONS OF ACTIVE SPACECRAFT AND EXPERIMENTS

This section contains descriptions of scientific spacecraft (including both free-flying spacecraft and Shuttle-attached payloads) and experiments that were active at some time during the period from June 1, 1983, to September 30, 1984 or later. The descriptions are sorted first by spacecraft common name. Within each spacecraft listing, experiments are ordered by the last name of the principal investigator, lead investigator, or team leader. The prelaunch generic name, IMP-J, of Explorer 50 is used as its common name. If the common name, as used by NSSDC, is not known, the reader should refer to an alternate common name in the "Index of Active and Planned Spacecraft and Experiments" (Section 4) to obtain the cross reference to the NSSDC common name.

Each spacecraft or experiment entry in this section is composed of two parts, a heading and a brief description. Each heading lists (1) specific parameters and characteristics of the spacecraft and experiments and (2) spacecraft and experiment personnel along with their affiliations. Definitions of some of the parameters found in these headings are given in Appendix C.

2.1 Contents of Spacecraft Entries

The heading for each spacecraft description in this section includes a set of initial orbit parameters: orbit type, epoch date, orbit period, apoapsis, periapsis, and inclination for the spacecraft orbit. No orbit parameters are listed for lander, flyby, or probe missions. In addition, the heading contains the spacecraft or Shuttle-attached payload weight, launch date, site, vehicle, common and alternate names, NSSDC ID code, sponsoring country and agency, spacecraft personnel, and personnel codes and affiliations. The personnel codes used are as follows:

CO (general contact)
MG (program manager)
MM (mission manager)
MO (mission operations manager)
MS (mission scientist)
PC (project coordinator)
PD (project director)
PE (project engineer)
PM (project manager)
PS (project scientist)
SC (program scientist)
TD (technical director)

This terminology is standard for NASA missions; the equivalent functions for the missions of other countries or agencies have been given the same position names. The spacecraft or Shuttle-attached payload brief description is immediately below each heading.

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2.2 Contents of Experiment Entries

Each experiment entry heading includes the experiment name, the NSSDC ID code, the investigative program, the investigation discipline, and the names, titles, and affiliations or locations of the investigators associated with the experiment. The experiment brief description is immediately below each experiment entry heading.

The titles for experiment investigators commonly used in this report include the following:

PI (principal investigator)
LI (lead investigator)
TL (team leader)
CI (co-investigator)
OI (other investigator)
TM (team members)

Other investigator titles such as deputy team leader (DT), experiment manager (EM), experiment scientist (ES), or general contact (CO) may also be used.

Each experiment is assigned an investigative program category. For NASA-sponsored investigations these program categories include one of the following NASA Headquarters division codes:

CODE EB (Life Sciences)
CODE EC (Communications)
CODE EE (Earth Science & Applications)
CODE EL (Solar System Exploration)
CODE EN (Materials Processing)
CODE EZ (Astrophysics)
CODE RS (Space Systems)

The addition of "/CO-OP" to any code indicates a cooperative effort between NASA and another agency or country.

2.3 Active Spacecraft and Experiment Descriptions

A free-flying spacecraft is included in the active section of this report if it had a status of "normal" or "partial" and a data acquisition rate of "standard" or "substandard" for any period of time since June 1, 1983. Experiments that meet these same criteria also are included. Scientific Shuttle-attached payloads which were launched and returned to earth with the Shuttle during this same time period are included in the active section of this report and treated in a manner similar to free-flying spacecraft.

Active spacecraft with only passive experiments, such as laser reflectors or those used only in upper atmospheric drag observations, are not included in this section, but are listed in Appendix A.

*************************** 1977-007A ***************************

SPACECRAFT COMMON NAME- 1977-007A
ALTERNATE NAMES- 09803, USAF OPERATIONAL SAT-77

NSSDC ID- 77-007A

LAUNCH DATE- 02/06/77 WEIGHT- KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- TITAN 3C

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 02/08/77
ORBIT PERIOD- 1436. MIN	INCLINATION- 0. DEG
PERIAPSIS- 36000. KM ALT	APOAPSIS- 36000. KM ALT

PERSONNEL

PM -	SPACE DIVISION	USAF-LAS
PS - W.D.	EVANS	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

The satellite was placed in a geostationary orbit with some station-changing capabilities. It was spin stabilized at 6 rpm with its spin vector aligned along a radius vector to the earth by an active control system. Real-time particle data were used by selected U.S. agencies for space disturbance monitoring and forecasting.

------- 1977-007A, HIGBIE ---

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTOR

NSSDC ID- 77-007A-01 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - P.R.	HIGBIE	LOS ALAMOS NAT LAB
OI - R.D.	BELIAN	LOS ALAMOS NAT LAB
OI - D.N.	BAKER	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

The energetic particle detector consisted of four solid-state detector units and measured electron, proton, and alpha-particle populations. The low-energy electron (LEE) unit was made with five separate elements, each with a 5-deg half-angle collimator (HAC); these detectors viewed at 0 deg, plus and minus 30 deg, and plus and minus 60 deg latitude relative to the spacecraft equatorial plane. The LEE measured electrons above seven threshold energies ranging from 30 to 300 keV. The high-energy electron unit consisted of one detector with an 8-deg HAC; fluxes above seven threshold energies ranging from 0.2 to 2.0 MeV were measured. The low-energy proton unit consisted of a single detector with a guard scintillator, a 5-deg HAC, and discriminators for 11 threshold energies ranging from 50 to 500 keV. The high-energy proton (HEP) unit was a three-element telescope with a guard scintillator and a 15-deg HAC that measured protons within 16 energy intervals ranging from 0.3 to 150 MeV. On command, the HEP could measure alpha particles in 16 energy intervals ranging from 1.2 to 600 MeV.

*************************** 1981-025A ***************************

SPACECRAFT COMMON NAME- 1981-025A
ALTERNATE NAMES- 12339

NSSDC ID- 81-025A

LAUNCH DATE- 03/16/81 WEIGHT- KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- TITAN 3C

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 03/17/81
ORBIT PERIOD- 1421.2 MIN	INCLINATION- 1.9 DEG
PERIAPSIS- 35463. KM ALT	APOAPSIS- 35527. KM ALT

PERSONNEL

PM -	SPACE DIVISION	USAF-LAS
PS - W.D.	EVANS	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

The satellite was placed in a geostationary orbit with some station-changing capabilities. It was spin stabilized at 6 rpm with its spin vector aligned along a radius vector to the earth by an active control system. Real-time particle data were used by selected U.S. agencies for space disturbance monitoring and forecasting.

------- 1981-025A, HIGBIE ---

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTOR

NSSDC ID- 81-025A-01 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - P.R.	HIGBIE	LOS ALAMOS NAT LAB
OI - R.D.	BELIAN	LOS ALAMOS NAT LAB
OI - D.N.	BAKER	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

The energetic particle detector consisted of four solid-state detector units and measured electron, proton, and alpha-particle populations. The low-energy electron (LEE) unit was made with five separate elements, each with a 5-deg half-angle collimator (HAC); these detectors viewed at 0 deg, plus and minus 30 deg, and plus and minus 60 deg latitude relative to the spacecraft equatorial plane. The LEE measured electrons above seven threshold energies ranging from 30 to 300 keV. The high-energy electron unit consisted of one detector with an 8-deg HAC; fluxes above seven threshold energies ranging from 0.2 to 2.0 MeV were measured. The low-energy proton unit consisted of a single detector with a guard scintillator, a 5-deg HAC, and discriminators for 11 threshold energies ranging from 50 to 500 keV. The high-energy proton (HEP) unit was a three-element telescope with a guard scintillator and a 15-deg HAC that measured protons within 16 energy intervals ranging from 0.3 to 150 MeV. On command, the HEP could measure alpha particles in 16 energy intervals ranging from 1.2 to 600 MeV. This instrument had a fast-time mode for electrons.

*************************** 1982-019A ***************************

SPACECRAFT COMMON NAME- 1982-019A
ALTERNATE NAMES- 13086

NSSDC ID- 82-019A

LAUNCH DATE- 03/06/82 WEIGHT- KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 03/07/82
ORBIT PERIOD- 1436.1 MIN	INCLINATION- 1.6 DEG
PERIAPSIS- 35777. KM ALT	APOAPSIS- 35795. KM ALT

PERSONNEL

PM -	SPACE DIVISION	USAF-LAS
PS - W.D.	EVANS	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

The satellite was placed in a geostationary orbit with some station-changing capabilities. It was spin stabilized at 6 rpm with its spin vector aligned along a radius vector to the earth by an active control system. Real-time particle data were used by selected U.S. agencies for space disturbance monitoring and forecasting.

------- 1982-019A, HIGBIE ---

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTOR

NSSDC ID- 82-019A-01 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - P.R.	HIGBIE	LOS ALAMOS NAT LAB
OI - R.D.	BELIAN	LOS ALAMOS NAT LAB
OI - D.N.	BAKER	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

The energetic particle detector consisted of four solid-state detector units and measured electron, proton, and alpha-particle populations. The low-energy electron (LEE) unit was made with five separate elements, each with a 5-deg half-angle collimator (HAC); these detectors viewed at 0 deg, plus and minus 30 deg, and plus and minus 60 deg latitude relative to the spacecraft equatorial plane. The LEE measured electrons above seven threshold energies ranging from 30 to 300 keV. The high-energy electron unit consisted of one detector with an 8-deg HAC; fluxes above seven threshold energies ranging from 0.2 to 2.0 MeV were measured. The low-energy proton unit consisted of a single detector with a guard scintillator, a 5-deg HAC, and discriminators for 11 threshold energies ranging from 50 to 500 keV. The high-energy proton (HEP) unit was a three-element telescope with a guard scintillator and a 15-deg HAC that measured protons within 16 energy intervals ranging from 0.3 to 150 MeV. On command, the

HEP could measure alpha particles in 16 energy intervals ranging from 1.2 to 600 MeV. This instrument had a fast-time mode for electrons.

************************** 1984-037A **************************

SPACECRAFT COMMON NAME- 1984-037A
ALTERNATE NAMES- 14930

NSSDC ID- 84-037A

LAUNCH DATE- 04/14/84 WEIGHT- KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

PERSONNEL

PM -	SPACE DIVISION	USAF-LAS
PS - W.D.	EVANS	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

The satellite was placed in a geostationary orbit with some station-changing capabilities. It was spin stabilized at 6 rpm with its spin vector aligned along a radius vector to the earth by an active control system. Real-time particle data were used by selected U.S. agencies for space disturbance monitoring and forecasting.

------- 1984-037A, HIGBIE -------------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTOR

NSSDC ID- 84-037A-01 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - P.R.	HIGBIE	LOS ALAMOS NAT LAB
OI - R.D.	BELIAN	LOS ALAMOS NAT LAB
OI - D.N.	BAKER	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

The energetic particle detector consisted of four solid-state detector units to measure electron, proton, and alpha-particle populations. The low-energy electron (LEE) unit was made with five separate elements, each with a 5-deg half-angle collimator (HAC); these detectors viewed at 0 deg, plus and minus 30 deg, and plus and minus 60 deg latitude relative to the spacecraft equatorial plane. The LEE measured electrons above seven threshold energies ranging from 30 to 300 keV. The high-energy electron unit consisted of one detector with an 8-deg HAC; fluxes above seven threshold energies ranging from 0.2 to 2.0 MeV were measured. The low-energy proton unit consisted of a single detector with a guard scintillator, a 5-deg HAC, and discriminators for 11 threshold energies ranging from 50 to 500 keV. The high-energy proton (HEP) unit was a three-element telescope with a guard scintillator and a 15-deg HAC that measured protons within 16 energy intervals ranging from 0.3 to 150 MeV. On command, the HEP could measure alpha particles in 16 energy intervals ranging from 1.2 to 600 MeV. This instrument had a fast-time mode for electrons.

************************** AMPTE/CCE **************************

SPACECRAFT COMMON NAME- AMPTE/CCE
ALTERNATE NAMES- AMPTE/CHARGE COMP EXPL, CHARGE COMPOSITION EXPL
CCE, 15199

NSSDC ID- 84-088A

LAUNCH DATE- 08/16/84 WEIGHT- 242. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE-
ORBIT PERIOD- 930. MIN	INCLINATION- 5.0 DEG
PERIAPSIS- 550. KM ALT	APOAPSIS- 49400. KM ALT

PERSONNEL

MG - M.B.	WEINREB	NASA HEADQUARTERS
SC - J.T.	LYNCH	NASA HEADQUARTERS
PM - G.W.	OUSLEY	NASA-GSFC
PS - M.H.	ACUNA	NASA-GSFC
PI - S.M.	KRIMIGIS	APPLIED PHYSICS LAB

BRIEF DESCRIPTION

The AMPTE (Active Magnetospheric Particle Tracer Explorers) mission was designed to study the access of solar-wind ions to the magnetosphere, the convective-diffusive transport and energization of magnetospheric particles, and the interactions of plasmas in space. The program consisted of three spacecraft: the CCE; the IRM, which provided multiple ion releases in the solar wind, the magnetosheath, and the magnetotail, with in situ diagnostics of each; and the UKS, which uses thrusters to keep station near the IRM to provide two-point local measurements. This particular spacecraft, the CCE (Charge Composition Explorer), was instrumented to detect those lithium and barium tracer ions from the IRM releases that were transported into the magnetosphere within the CCE orbit. The spacecraft was spin-stabilized at 10 rpm with its spin axis in the equatorial plane and offset from the earth-sun line by about 20 deg, and could adjust attitude with both magnetic torqueing and cold gas thrusters. The CCE used a 2.E8-bit tape recorder and redundant 2.5-W S-Band transponders. The spacecraft battery was charged by a 140-W solar array. Each instrument was provided by a Lead Investigator (LI). The PI for the U.S. AMPTE Program and for the CCE was S. M. Krimigis. The PI for the European AMPTE Program, the IRM, was G. Haerendel.

------- AMPTE/CCE, GLOECKLER ----------------------------------

INVESTIGATION NAME- CHARGE-ENERGY-MASS SPECTROMETER(CHEM)

NSSDC ID- 84-088A-03 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

LI - G.	GLOECKLER	U OF MARYLAND
OI - F.M.	IPAVICH	U OF MARYLAND
OI - D.	HAMILTON	U OF MARYLAND
OI - W.	STUDEMANN	MPI-AERONOMY
OI - B.	WILKEN	MPI-AERONOMY
OI - G.	KREMSER	MPI-AERONOMY
OI - D.K.	HOVESTADT	MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

The instrument consisted of an entrance collimator and electrostatic analyzer section followed by a time-of-flight and total-energy-measurement section floating at a 30kV acceleration potential. The energy range covered was from 1 to 300 keV/Q, with a geometric factor of 2.E-3 sq cm-sr and 32-sector angular resolution. Energy resolution was 5 to 18%, and all charge states and isotopes of H and He, the charge states of Li, and the major elements and charge states up to and including Fe were resolved.

------- AMPTE/CCE, MCENTIRE -----------------------------------

INVESTIGATION NAME- MEDIUM ENERGY PARTICLE ANALYZER (MEPA)

NSSDC ID- 84-088A-02 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

LI - R.W.	MCENTIRE	APPLIED PHYSICS LAB
OI - S.M.	KRIMIGIS	APPLIED PHYSICS LAB
OI - A.T.Y.LUI		APPLIED PHYSICS LAB
OI - E.P.	KEATH	APPLIED PHYSICS LAB

BRIEF DESCRIPTION

The instrument consisted of a collimator and an electron sweeping magnet followed by a 10-cm time-of-flight (TOF) telescope with thin foils at the front and mid-point and a solid-state detector at the rear. Incident ion TOF was measured from the front foil to the back detector and from the center foil to the back detector, and energy was measured in the back detector. The dual TOF measurement and very fast energy channel processing gave high immunity to accidental events, and allowed the instrument to measure the composition and spectra of both common species and tracer ions over a species-dependent energy range of >10 keV/nucleon to 6 MeV/nucleon, with a geometric factor of 1.E-2 sq cm-sr and 32-sector angular resolution.

------- AMPTE/CCE, POTEMRA ------------------------------------

INVESTIGATION NAME- CCE MAGNETOMETER (MAG)

NSSDC ID- 84-088A-05 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

LI - T.A.	POTEMRA	APPLIED PHYSICS LAB
OI - M.H.	ACUNA	NASA-GSFC

BRIEF DESCRIPTION

The instrument was a triaxial fluxgate magnetometer mounted on a 2.4-m boom. It had seven automatically switchable ranges (from plus and minus 16 nT to plus and minus 65,536 nT) with resolution commensurate with a 13-bit A/D converter, and was read out at 8.6 vector samples/s. The signals from two sensors (one parallel to the spin axis and one orthogonal) were also fed into 5-50 Hz bandpass channels that were read out every 5 s.

------- AMPTE/CCE, SCARF---

INVESTIGATION NAME- PLASMA WAVE EXPERIMENT (PWE)

NSSDC ID- 84-088A-04 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

LI - F.L.	SCARF	TRW SYSTEMS GROUP

BRIEF DESCRIPTION

The instrument consisted of a balanced electric dipole with an effective length of 70 cm and six bandpass channels covering the range from 5 Hz to 178 kHz. The highest five channels were sampled every 0.6 s and the lowest (5-50 Hz) channel was sampled every 20 s. The instrument was the flight spare of the Pioneer Venus Electric Field Detector, with two additional filters added.

------- AMPTE/CCE, SHELLEY---

INVESTIGATION NAME- HOT PLASMA COMPOSITION EXPERIMENT (HPCE)

NSSDC ID- 84-088A-01 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL

LI - E.G.	SHELLEY	LOCKHEED PALO ALTO
OI - R.D.	SHARP	LOCKHEED PALO ALTO
OI - R.G.	JOHNSON	OF. OF SCI&TECH POLICY
OI - W.K.	PETERSON	LOCKHEED PALO ALTO
OI - G.	HAERENDEL	MPI-EXTRATERR PHYS
OI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - P.X.	EBERHARDT	U OF BERNE
OI - H.	BALSIGER	U OF BERNE
OI - J.	GEISS	U OF BERNE
OI - A.G.	GHIELMETTI	U OF BERNE
OI - D.T.	YOUNG	LOS ALAMOS NAT LAB
OI - D.M.	KLUMPAR	U OF TEXAS, DALLAS

BRIEF DESCRIPTION

This instrument consisted of an entrance collimator and retarding potential analyzer, a curved-plate electrostatic energy analyzer, and a combined electrostatic-magnetic mass analyzer in series. The energy range covered was approximately 0 to 17 keV/Q, with a geometric factor ranging from 0.01 to 0.05 sq cm-sr, an energy resolution from 6 to 60%, and a M/Q resolution of 10%. This instrument cleanly separated Li+ and Ba+ tracer ions from the background. It was nearly identical to one flown on DE 1 by the same group of investigators. An additional set of eight spectrometers containing permanent bending magnets and channeltrons measured electrons in eight channels from 50 eV to 25 keV.

**************************** AMPTE/IRM ************************

SPACECRAFT COMMON NAME- AMPTE/IRM
ALTERNATE NAMES- ION RELEASE MODULE, AMPTE/ION RELEASE MODULE
IRM, 15200

NSSDC ID- 84-088B

LAUNCH DATE- 08/16/84 WEIGHT- 705. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA 3924

SPONSORING COUNTRY/AGENCY
FED REP OF GERMANY BMFT

ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE-
ORBIT PERIOD- 2630. MIN	INCLINATION- 28.7 DEG
PERIAPSIS- 550. KM ALT	APOAPSIS- 112800. KM ALT

ORIGINAL PAGE IS
OF POOR QUALITY

PERSONNEL

MG - M.	OTTERBEIN	BMFT
PM - U.	JONELEIT	DFVLR
PM - B.	HAUSLER	MPI-EXTRATERR PHYS
PS - G.	PASCHMANN	MPI-EXTRATERR PHYS
PI - G.	HAERENDEL	MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

The AMPTE (Active Magnetospheric Particle Tracer Explorers) mission was designed to study the access of solar-wind ions to the magnetosphere, the convective-diffusive transport and energization of magnetospheric particles, and the interactions of plasmas in space. The program consisted of three spacecraft: the CCE, which measured in the magnetosphere the ions released by the IRM; the IRM; and the UKS, which used thrusters to keep station near the IRM to provide two-point local measurements. The IRM provided multiple ion releases in the solar wind, the magnetosheath, and the magnetotail with in situ diagnostics of each. The IRM spacecraft was spin-stabilized at 15 rpm. Its spin axis was initially in the ecliptic plane, but later it was adjusted with magnetic torqueing to be at right angles to the ecliptic. The power system was a 60-W solar array with redundant batteries. There was a redundant S-band telemetry and telecommand system. Telemetry rates could be chosen between 1 and 8 kbps. For injection into the final orbit, the IRM carried its own kick stage. The PI for the German AMPTE Program was G. Haerendel. The release experiment and the diagnostic instruments were each provided by a lead investigator (LI).

------- AMPTE/IRM, HAUSLER---------------------------------------

INVESTIGATION NAME- PLASMA WAVE SPECTROMETER

NSSDC ID- 84-088B-04 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

LI - B.	HAUSLER	MPI-EXTRATERR PHYS
OI - R.	TREUMANN	MPI-EXTRATERR PHYS
OI - D.A.	GURNETT	U OF IOWA
OI - R.R.	ANDERSON	U OF IOWA
OI - R.	HOLZWORTH	U OF WASHINGTON
OI - H.C.	KOONS	AEROSPACE CORP

BRIEF DESCRIPTION

The instrument used a 42-m tip-to-tip antenna to measure electric fields from dc to 5 MHz and two boom-mounted search coil magnetometers to measure magnetic fields from 30 Hz to 1 MHz. The signals were analyzed by a VLF/MF 16-channel spectrum analyzer, three VLF narrow-band swept-frequency receivers, a 60-channel HF stepped-frequency receiver, and an analog wide-band receiver.

------- AMPTE/IRM, HOVESTADT-------------------------------------

INVESTIGATION NAME- SUPRATHERMAL IONIC CHARGE ANALYZER
(SULEICA)

NSSDC ID- 84-088B-06 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

LI - D.K.	HOVESTADT	MPI-EXTRATERR PHYS
OI - M.	SCHOLER	MPI-EXTRATERR PHYS
OI - E.	MOEBIUS	MPI-EXTRATERR PHYS
OI - B.	KLECKER	MPI-EXTRATERR PHYS
OI - F.M.	IPAVICH	U OF MARYLAND
OI - G.	GLOECKLER	U OF MARYLAND

BRIEF DESCRIPTION

The main instrument consisted of a curved plate electrostatic energy-per-charge analyzer followed by a 12-cm time-of-flight telescope with a thin carbon foil at the front and a solid-state detector at the rear, which measured ion velocity and residual energy. The energy-per-charge range was 10 to 300 keV/Q. The mass resolution, delta M/M, ranged from 0.25 to 0.12. The instrument package also contained an electron sensor for the energy range 35 to 220 keV, provided by University of California, Berkeley.

------- AMPTE/IRM, LUEHR---

INVESTIGATION NAME- MAGNETOMETER

NSSDC ID- 84-088B-02 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

LI - H. LUEHR — BRAUNSCHWEIG TECH U
OI - N. KLOECKER — BRAUNSCHWEIG TECH U
OI - B. HAUSLER — MPI-EXTRATERR PHYS
OI - M.H. ACUNA — NASA-GSFC

BRIEF DESCRIPTION

The instrument was a three-axis fluxgate magnetometer mounted on a 2-m boom. It had two switchable ranges (plus and minus 4 microtesla, and plus and minus 60 microtesla) with resolutions of 0.12 and 1.8 nT, respectively and was read out at 32, 16, 8, or 4 vector samples per second, depending on the T/M rate. Signals from each sensor were also fed into four band pass filters with 5.5, 11, 22, and 44-Hz center frequencies and were read out up to two times per second.

------- AMPTE/IRM, PASCHMANN-----------------------------------

INVESTIGATION NAME- 3-D PLASMA ANALYZER

NSSDC ID- 84-088B-03 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

LI - G. PASCHMANN — MPI-EXTRATERR PHYS
OI - N. SCKOPKE — MPI-EXTRATERR PHYS
OI - W. BAUMJOHANN — U OF MUNSTER
OI - C.W. CARLSON — U OF CALIF, BERKELEY

BRIEF DESCRIPTION

The main instrument consisted of two symmetrical quadrispherical electrostatic analyzers to measure the three-dimensional distributions of electrons and ions, respectively, over 4-pi sr during every satellite spin period (4 s). The energy range covered was 15 eV/Q to 30 keV/Q in 30 channels. The angular resolution was 22.5 deg. Moments of the measured distributions were directly computed onboard. An additional retarding-potential analyzer measured the flux of electrons between approximately 0 and 25 eV.

------- AMPTE/IRM, ROSENBAUER-----------------------------------

INVESTIGATION NAME- MASS SEPARATING ION SENSOR (MSIS)

NSSDC ID- 84-088B-05 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

LI - H.R. ROSENBAUER — MPI-AERONOMY
OI - H. GRUENWALDT — MPI-AERONOMY
OI - M. WITTE — MPI-AERONOMY
OI - H. GOLDSTEIN — MPI-AERONOMY

BRIEF DESCRIPTION

The instrument consisted of a retarding-potential analyzer entrance section and a toroidal electrostatic energy-per-charge analyzer, followed by a quadrispherical electrostatic analyzer with superimposed radial magnetic field for mass-per-charge analysis. The energy range covered was approximately 0 to 12 (or 24) keV/Q, with adequate mass resolution to separate the Li and Ba tracer ions. Up to eight different ion species could be analyzed simultaneously.

------- AMPTE/IRM, VALENZUELA-----------------------------------

INVESTIGATION NAME- ION RELEASE EXPERIMENT

NSSDC ID- 84-088B-01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

LI - A. VALENZUELA — MPI-EXTRATERR PHYS
OI - G. HAERENDEL — MPI-EXTRATERR PHYS
OI - H. FOEPPL — MPI-EXTRATERR PHYS
OI - E. RIEGER — MPI-EXTRATERR PHYS
OI - O. BAUER — MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

The experiment consisted of eight lithium and eight barium canisters, which were injected from the IRM in pairs by ground command and ignited 10 minutes after separation from the spacecraft. Each of these was either totally lithium or totally barium. A pair of Li/Ba canisters produced a total of 2.E25/7.E24 Li/Ba atoms, respectively, which were subsequently ionized by solar radiation. Li releases in the solar wind, which were carried out in August/September, 1984, were to be followed by an artificial comet release of Ba ions in the dawnside magnetosheath and a number of Ba and Li releases in the geomagnetic tail. In situ diagnostics by IRM and UKS and optical observations of the clouds from the ground were followed by tracing of the ions in the inner magnetosphere by CCE.

*************************** AMPTE/UKS ***************************

SPACECRAFT COMMON NAME- AMPTE/UKS
ALTERNATE NAMES- UK SUBSATELLITE, UNITED KINGDOM SUBSAT
UKS, 15201

NSSDC ID- 84-088C

LAUNCH DATE- 08/16/84 WEIGHT- 77. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED KINGDOM SERC

ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC — EPOCH DATE-
ORBIT PERIOD- 2630. MIN — INCLINATION- 28.5 DEG
PERIAPSIS- 550. KM ALT — APOAPSIS- 112800. KM ALT

PERSONNEL

PM - A.K. WARD — RUTHERFORD APPLETON L.
PS - D.A. BRYANT — RUTHERFORD APPLETON L.

BRIEF DESCRIPTION

The AMPTE (Active Magnetospheri Particle Tracer Explorers) mission was designed to study the access of solar-wind ions to the magnetosphere, the convective-diffusive transport and energization of magnetospheric particles, and the interactions of plasmas in space. The program consisted of three spacecraft: the CCE, which measured in the magnetosphere the ions released by the IRM; the IRM, which provided multiple ion releases in the solar wind, the magnetosheath, and the magnetotail, with in situ diagnostics of each; and the UKS. The UKS was one spacecraft of the AMPTE (Active Magnetosphere Particle Tracer Experiment) program (along with CCE and IRM) and served as a subsatellite of the IRM spacecraft. Its purpose was to help distinguish between spatial structure and temporal changes in the plasma phenomena initiated by ion releases from the IRM and in the natural magnetospheric environment. Measured quantitie were similar to those of the IRM and include magnetic fields, positive ions, electrons, plasma waves, and modulations in ions and electrons. The spacecraft was spin-stabilized at 12 rpm and employed S-band communications. It carried a cold gas propulsion system and a VHF radar system for station keeping with the IRM normally at a distance of a few hundred kilometers. The lead investigator for the UKS spacecraft was D. A. Bryant. The spacecraft power supply apparently failed on January 15, 1985.

------- AMPTE/UKS, GOUGH-----------------------------------

INVESTIGATION NAME- PARTICLE MODULATION ANALYZER

NSSDC ID- 84-088C-01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

LI - M.P. GOUGH — U OF SUSSEX

BRIEF DESCRIPTION

The instrument consisted of microprocessor-controlled counting and timing circuitry which used as input the particle arrival pulses from the electron and ion spectrometers on board the spacecraft. The instrument computed autocorrelation functions and fast Fourier transforms of the particle modulations resulting from wave-particle interactions in the frequency range 1 Hz to 1 MHz with an average frequency resolution of 3%.

------- AMPTE/UKS, HALL-----------------------------------

INVESTIGATION NAME- 3-D ELECTRON ANALYZER

NSSDC ID- 84-088C-02 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

LI - D.S. HALL — RUTHERFORD APPLETON L.
OI - C.P. CHALONER — RUTHERFORD APPLETON L.

BRIEF DESCRIPTION

Electron distribution functions were measured using two hemispherical electrostatic analyzers with microchannel plate detectors. The instrument had several operating modes. In its primary mode electron intensities were measured, in 1-s periods, in 24 energy channels covering the range 6 eV to 25 keV within 8 angular sectors spanning 180 deg relative to the spacecraft spin axis. Data from a complete 5-s UKS spin period were needed to measure the three-dimensional distribution

function. The geometric factors of the sectors were within the range 0.4 to 1.0 sq mm-sr and the energy bandwidth, delta E/E, was 3%.

------- AMPTE/UKS, JOHNSTONE-----------------------------------

INVESTIGATION NAME- THREE-DIMENSIONAL ION ANALYZER

NSSDC ID- 84-088C-03 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL
LI - A.D. JOHNSTONE MULLARD SPACE SCI LAB

BRIEF DESCRIPTION
The objective of this investigation was to study the three-dimensional ion distributions in the plasma clouds, the solar wind, the magnetosphere, and the boundaries between them and to measure these distributions with high time and angular resolutions. The instrument consisted of a pair of 270-deg spherical electrostatic energy analyzers with microchannel plate detectors that measured the three-dimensional energy/charge distribution of positive ions from 10 eV/Q to 20 keV/Q over the polar angle range 0 to 180 deg with respect to the spin axis of the spacecraft. A complete set of measurements was obtained every 5-s spin period.

------- AMPTE/UKS, SOUTHWOOD-----------------------------------

INVESTIGATION NAME- MAGNETOMETER

NSSDC ID- 84-088C-04 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
LI - D.J. SOUTHWOOD IMPERIAL COLLEGE
OI - S.W.H.COWLEY IMPERIAL COLLEGE
OI - C.T. RUSSELL U OF CALIF, LA

BRIEF DESCRIPTION
The objective of this investigation was to study the magnetic fields in the near-earth environment. The instrument consisted of a three-axis orthogonal fluxgate magnetometer with ring-core sensors. It was a refurbished ISEE 1/2 flight spare. One of the two possible ranges, plus and minus 256 or 8192 nT, could be selected by ground command. The accuracy of the instrument was plus or minus 1 nT per axis in the high range and plus or minus 0.03 nT in the low range.

------- AMPTE/UKS, WOOLLISCROFT--------------------------------

INVESTIGATION NAME- PLASMA WAVE SPECTROMETER

NSSDC ID- 84-088C-05 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL
LI - L.J.C.WOOLLISCROFT U OF SHEFFIELD
OI - D. JONES BRITISH ANTARCTIC SURV
OI - M.P. GOUGH U OF SUSSEX
OI - P. CHRISTIANSEN U OF SUSSEX

BRIEF DESCRIPTION
The instrument consisted of an electric dipole antenna with 7-m separation between its sensors and a high permeability core coil to measure the magnetic component of the wave field. The electric component was measured up to 2 MHz and the magnetic component up to 20 kHz. The signal processing equipment was composed of a stepped-frequency analyzer covering the range up to 130 kHz and four discrete filters with 10% bandwidths covering the range up to 2 MHz. A correlator (64 point auto) permitted study at higher frequency resolution.

************************** ASTRON***************************

SPACECRAFT COMMON NAME- ASTRON
ALTERNATE NAMES- 13901, AUTOMATIC STATION ASTRON

NSSDC ID- 83-020A

LAUNCH DATE- 03/23/83 WEIGHT- KG
LAUNCH SITE- UNKNOWN, U.S.S.R.
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
U.S.S.R. SAS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 03/24/83
ORBIT PERIOD- 5880. MIN INCLINATION- 51.5 DEG
PERIAPSIS- 2000. KM ALT APOAPSIS- 200000. KM ALT

PERSONNEL
PM - UNKNOWN
PS - UNKNOWN

BRIEF DESCRIPTION
The automatic astronomical station (ASTRON) carried a UV telescope, X-ray spectrometer, and service systems. Its high apogee permitted the influences of the earth's radiation belts and Lyman-alpha radiation from the geocorona to be excluded from the measurements. Spectral recordings of stars, galaxies, and the night-sky background were made.

------- ASTRON, BOYARCHUK--------------------------------------

INVESTIGATION NAME- X-RAY SPECTROMETERS

NSSDC ID- 83-020A-02 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL
PI - A.A. BOYARCHUK CRIMEAN ASTROPHYS OBS

BRIEF DESCRIPTION
The X-ray spectrometer had a total area of 1780 sq cm and was composed of two detectors. Each detector consisted of 8 modules, had 10 pulse-height channels in the 2- to 25-keV band, and had a 3-deg (FWHM) field of view. Total-rate data were taken every 2.28 ms and pulse-height data were taken every 0.3 s.

------- ASTRON, SEVERNY--

INVESTIGATION NAME- ULTRAVIOLET TELESCOPE

NSSDC ID- 83-020A-01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
SOLAR PHYSICS

PERSONNEL
PI - A.B. SEVERNY CRIMEAN ASTROPHYS OBS
OI - V.A. AMBARTSUMIAN CRIMEAN ASTROPHYS OBS
OI - A.A. BOYARCHUK CRIMEAN ASTROPHYS OBS
OI - G.C. COURTES CNRS-LAS

BRIEF DESCRIPTION
This instrument consisted of a large ultraviolet telescope and a scanning photometer. The telescope had a diameter of 80 cm. The photometer covered the range of 1100 to 3500 A.

************************** AUREOL 3*************************

SPACECRAFT COMMON NAME- AUREOL 3
ALTERNATE NAMES- 12848, ARCAD 3
AUREOLE 3, OREOL 3

NSSDC ID- 81-094A

LAUNCH DATE- 09/21/81 WEIGHT- 1000. KG
LAUNCH SITE-
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
U.S.S.R. SAS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 09/22/81
ORBIT PERIOD- 108.2 MIN INCLINATION- 82.6 DEG
PERIAPSIS- 380. KM ALT APOAPSIS- 1920. KM ALT

PERSONNEL
PM - M.G. CHARLES CESR
PS - Y.I. GALPERIN IKI
PS - H. REME CESR

BRIEF DESCRIPTION
Aureol 3 was a Soviet satellite that was part of the Intercosmos Series, subset AUOS-T (automatic universal orbital station terrestrial studies). The spacecraft was launched September 21, 1981, in a near-polar orbit. The center portion of the spacecraft was a pressurized cylinder 1.6 m in diameter and 2.7 m in height. Extending from the central body and deployed after launch were the telemetry and command antennas, the solar panels, and six booms holding various sensors away from the spacecraft. Magnetic torquing and gravity gradient were utilized to achieve three-axis stabilization. The Z axis of the spacecraft was aimed toward the center of the earth, the X axis was the direction of the spacecraft velocity vector. Both passive and active thermal control were used. Eight solar

panels and 28-V batteries provided a maximum power of 250 W, and an average power of 50 W. The spacecraft carried a total of 12 experiments (4 from the USSR, 7 from France, and 1 done jointly by France and the USSR). The overall objectives were to provide some answers to the numerous questions related to magnetosphere-ionosphere coupling at high latitudes. The phenomena of interest included aurorae, magnetospheric substorms, origin and transport of plasmas, associated energies, electric currents, and electric fields. The experiments planned to meet these objectives included measurements of ambient electron density, electron temperature, and plasma velocity; of charged particles over the range 0.1 eV to 255 keV, plus electrons with energies above 40 keV and protons with energies above 500 keV; of dc electric and magnetic fields (0 to 10 Hz); of ELF and VLF waves in the range 0.01 to 16 kHz; of electric fields at frequencies from 0.1 to 16 MHz; and of auroral photometry at 4278 A, 4861 A, and 6300 A. Commands were either carried out in real time or stored on a weekly basis. Two instruments were used for onboard processing of experimental data. The correlometer provided cross-correlation and autocorrelation data for the measurement from either the four Kukushka detectors (81-094A-01) or two Kukushka and two Pietstchanka (81-094A-02) detectors. The ONTCH-2ME instrument provided onboard processing of the data from the ISO F (81-094A-09) and ISO M (81-094A-10) experiments. Two telemetry systems were used, a direct read-out system used over French telemetry stations and a delayed read-out system that used tape-recording and play back over the Soviet telemetry stations. The routine scheduling of operations for the French experiments was initiated weekly (on Fridays), 24 days in advance. It was coordinated through the French Centre d'Operations Specialise ARCAD 3 (COS A3) and forwarded to the Institute for Space Research (IKI), Moscow, where it was merged with the input from the Russian experimenters. It was then returned to France for concurrence and returned to IKI Moscow 11 days prior to the beginning of operations. The schedule was then finalized and distributed 5 days prior to the beginning of operations.

------- AUREOL 3, BEGHIN--

INVESTIGATION NAME- ISOPROBE (RADIO-FREQUENCY PROBE)

NSSDC ID- 81-094A-08 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
IONOSPHERES AND RADIO PHYSICS
SPACE PLASMAS

PERSONNEL
PI - C. BEGHIN CNRS, CTR FOR SPECTROM

BRIEF DESCRIPTION
The Isoprobe (Interferometer Self-Oscillating Probe) experiment was basically a system of radio-frequency probes that was designed to provide ambient electron density, electron temperature and plasma velocity. The experiment used two identical probes, ISO 1 and ISO 2, mounted at different angles with respect to the spacecraft velocity vector. The difference between the data from ISO 1 and ISO 2 was used to determine the velocity of the plasma. Each probe consisted of five elements immersed in the plasma. Three elements could be connected to an rf generator, and the other two elements operated as receivers. The probes measured as a function of frequency (100 kHz to 15 MHz) the current flowing between the various "transmit-receive" pairs of elements. The current exhibited a sharp maximum at the upper hybrid frequency from which the electron density could be calculated. A sharp minimum in the current that was a function of Debye length provided a measurement of the electron temperature.

------- AUREOL 3, BERTHELIER---------------------------------

INVESTIGATION NAME- ION MASS SPECTROMETER (DYCTION)

NSSDC ID- 81-094A-07 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
IONOSPHERES

PERSONNEL
PI - J.J. BERTHELIER CRPE, CNRS-CNET

BRIEF DESCRIPTION
The Spectrometer DYCTION (dynamic-composition and temperature of ions) provided the total density, temperature and velocity of thermal ions. The major ions (H+, and He+ and O+) were measured simultaneously 70% of the time, and the minor ions were measured 20% of the time. These measurements were made in the direction of the satellite velocity vector. The remaining 10% of observation time was used to provide a rough sweep of suprathermal ions at incidence angles ranging from +30 deg to -30 deg in the horizontal (X-Y) plane of the satellite and ranging from +60 deg to -60 deg in the vertical plane of the satellite.

------- AUREOL 3, BERTHELIER---------------------------------------

INVESTIGATION NAME- ISO F (ELECTRIC FIELD PROBE)

NSSDC ID- 81-094A-09 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL
PI - J.J. BERTHELIER CRPE, CNRS-CNET
OI - O.A. MOLCHANOV IZMIRAN

BRIEF DESCRIPTION
The ISO F experiment consisted of four spherical Langmuir probes used to measure the three components of the electric field at frequencies between 0 and 10 Hz, two electric components at frequencies between 10 Hz and 16 kHz, and two components at frequencies from 0.1 to 10 MHz.

------- AUREOL 3, BERTHELIER---------------------------------------

INVESTIGATION NAME- TRAC (FLUXGATE MAGNETOMETER)

NSSDC ID- 81-094A-11 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - J.J. BERTHELIER CRPE, CNRS-CNET
OI - Y.I. GALPERIN IKI

BRIEF DESCRIPTION
The TRAC experiment used a three-axis fluxgate magnetometer to measure slow fluctuations (0 to 10 Hz) of the local magnetic field. The instrument has a resolution of 13 nT.

------- AUREOL 3, BOSQUED---

INVESTIGATION NAME- TBE SOFT PARTICLE SPECTROMETERS

NSSDC ID- 81-094A-04 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL
PI - J.M. BOSQUED PAUL SABATIER U
OI - H. REME CESR

BRIEF DESCRIPTION
The TBE (Very Low Energy) spectrometers were part of the Spectro package. The TBE 01 spectrometer measured electrons and protons in the energy range 10 eV to 1 keV, incident at an angle of 20 deg with respect to the Z axis of the satellite. The TBE 02 spectrometer measured electrons and protons in the energy range 10 eV to 10 keV, incident at an angle of 160 deg with respect to the Z axis of the satellite. Both instruments utilized electrostatic analyzers to select the energy steps.

------- AUREOL 3, BOSQUED---

INVESTIGATION NAME- ROBE SOFT PARTICLE SPECTROMETER

NSSDC ID- 81-094A-05 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL
PI - J.M. BOSQUED PAUL SABATIER U
OI - H. REME CESR

BRIEF DESCRIPTION
The ROBE Soft Particle Spectrometer was part of the Spectro package. It measured electrons and protons in the 250 eV to 20 keV range incident at two fixed angles (0 and 90 deg with respect to the Z axis of the spacecraft) and also at seven intermediate angles. A choice of the number of energy steps (8, 16, or 64) and of incidence angles (3, 8, or 9) was available by command.

------- AUREOL 3, BOSQUED---

INVESTIGATION NAME- ENERGETIC SPECTROMETER (ION)

NSSDC ID- 81-094A-06 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
IONOSPHERES

PERSONNEL
PI - J.M. BOSQUED PAUL SABATIER U
OI - H. REME CESR

BRIEF DESCRIPTION
The Energetic Ion Spectrometer experiment was part of the Spectro package. It consisted of two identical spectrometers, Ion 01 and Ion 02, that could detect ions in the range 1 to 32 u. A choice of two modes of operation was available by command, a thermal mode (5 to 150 eV/Q) and a suprathermal mode (150 eV/Q to 50 keV/Q). Ion 01 and Ion 02 were oriented at angles of 60 deg and 120 deg, respectively, with respect to the Z axis of the spacecraft.

------- AUREOL 3, GALPERIN-------------------------------------

INVESTIGATION NAME- KUKUSHKA SOFT PARTICLE SPECTROMETER

NSSDC ID- 81-094A-01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL
PI - Y.I. GALPERIN IKI
OI - R.A. KOVRAZHKIN IKI

BRIEF DESCRIPTION
The Kukushka spectrometer consisted of two proton detectors and two electron detectors using electrostatic analyzers to measure energies in the energy range from 50 eV to 15 keV. These detectors were aimed at an angle of 75 deg with respect to the Z axis of the spacecraft.

------- AUREOL 3, GALPERIN-------------------------------------

INVESTIGATION NAME- PIETSTCHANKA PARTICLE SPECTROMETER

NSSDC ID- 81-094A-02 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - Y.I. GALPERIN IKI
OI - R.A. KOVRAZHKIN IKI

BRIEF DESCRIPTION
The Pietstchanka spectrometer measured electrons and protons in the energy range 40 keV to 255 keV. This intermediate energy range was measured in five energy bands. This spectrometer was aimed at an angle of 30 deg with respect to the Z axis of the spacecraft.

------- AUREOL 3, GALPERIN-------------------------------------

INVESTIGATION NAME- FON ENERGETIC PARTICLE DETECTOR

NSSDC ID- 81-094A-03 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL
PI - Y.I. GALPERIN IKI
OI - R.A. KOVRAZHKIN IKI

BRIEF DESCRIPTION
The FON detector consisted of two Geiger counters that measured electrons with energies greater than 40 keV and protons with energies greater than 500 keV, and that were aimed at 20 and 90 deg with respect to the Z axis of the spacecraft.

------- AUREOL 3, GLASYSHEV-------------------------------------

INVESTIGATION NAME- ALTAIR (AURORAL PHOTOMETRY)

NSSDC ID- 81-094A-12 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY
ATMOSPHERIC PHYSICS

PERSONNEL
PI - V.A. GLASYSHEV IKI
OI - T. MULIARCHIK IKI

BRIEF DESCRIPTION
The ALTAIR experiment used three photometers (ALTAIR 1, 2, and 3) to measure auroral emissions at 4861 A, 4278 A and 6300 A. The instruments had a viewing angle of 2 deg, and they were aimed at an angle of 160 deg with respect to the Z axis of the spacecraft. A fourth photometer (ALTAIR 4), which had a 1-deg field of view and which was aimed at 28 deg with respect to the Z axis, was used for attitude determination.

------- AUREOL 3, LEFEUVRE-------------------------------------

INVESTIGATION NAME- ISO M (MAGNETIC FIELD PROBE)

NSSDC ID- 81-094A-10 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - F. LEFEUVRE CNRS, CTR FOR SPECTROM
OI - O.A. MOLCHANOV IZMIRAN

BRIEF DESCRIPTION
The ISO M experiment measured the three components of the magnetic field at frequencies between 10 Hz and 16 kHz.

************************** BHASKARA **************************

SPACECRAFT COMMON NAME- BHASKARA
ALTERNATE NAMES- SEO, 11392

NSSDC ID- 79-051A

LAUNCH DATE- 06/07/79 WEIGHT- 444. KG
LAUNCH SITE- KAPUSTIN YAR, U.S.S.R.
LAUNCH VEHICLE- INTRCOS

SPONSORING COUNTRY/AGENCY
INDIA ISRO
U.S.S.R. INTERCOS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 06/07/79
ORBIT PERIOD- 95.2 MIN INCLINATION- 50.7 DEG
PERIAPSIS- 512. KM ALT APOAPSIS- 557. KM ALT

PERSONNEL
MG - U.R. RAO ISRO SATELLITE CENTER
PD - K. KASTURIRANGAN ISRO SATELLITE CENTER
PS - D.P.N.CALLA SPACE APPLICATIONS CTR
PS - G. JOSEPH SPACE APPLICATIONS CTR

BRIEF DESCRIPTION
Bhaskara, the second Indian satellite, was launched as part of the satellite-for-earth-observations (SEO) program. It was placed in orbit by a Soviet vehicle launched from a cosmodrome in the U.S.S.R. The main objectives were to conduct earth observation experiments for applications related to hydrology, forestry, and geology using a two-band TV camera system, and to conduct ocean-surface studies using a two-frequency satellite microwave radiometer (SAMIR) system. Secondary objectives were to test engineering and data processing systems, to collect limited meteorological data from remote platforms, and to conduct scientific investigations in X-ray astronomy. Bhaskara was a 26-faced quasi-spherical polyhedron. It had a height of 1.66 m, and a diameter of 1.55 m. The satellite was named after the two "Bhaskaracharyas", astronomer-mathematicians of ancient India.

------- BHASKARA, CALLA-------------------------------------

INVESTIGATION NAME- SATELLITE MICROWAVE RADIOMETER (SAMIR)

NSSDC ID- 79-051A-01 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL
PI - D.P.N.CALLA SPACE APPLICATIONS CTR

BRIEF DESCRIPTION
The objectives of this investigation were to conduct studies over the Indian subcontinent and surrounding seas using a 19- and 22-GHz microwave radiometric system.

************************** BHASKARA 2 **************************

SPACECRAFT COMMON NAME- BHASKARA 2
ALTERNATE NAMES- 12968, SAT. FOR EARTH OBS. 2
SEO 2

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OF POOR QUALITY

NSSDC ID- 81-115A

LAUNCH DATE- 11/20/81 WEIGHT- 444. KG
LAUNCH SITE- KAPUSTIN YAR, U.S.S.R.
LAUNCH VEHICLE- C-1

SPONSORING COUNTRY/AGENCY
INDIA ISRO

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 11/20/81
ORBIT PERIOD- 95.2 MIN INCLINATION- 50.6 DEG
PERIAPSIS- 520. KM ALT APOAPSIS- 542. KM ALT

PERSONNEL
MG - U.R. RAO ISRO SATELLITE CENTER
PD - K. KASTURIRANGAN ISRO SATELLITE CENTER
PS - O.P.N.CALLA SPACE APPLICATIONS CTR
PS - G. JOSEPH SPACE APPLICATIONS CTR

BRIEF DESCRIPTION
Bhaskara 2, the Indian satellite, was launched as part of the satellite-for-earth-observations (SEO) program. It was placed in orbit by a Soviet vehicle launched from a cosmodrome in the U.S.S.R. The main objectives were to conduct earth observation experiments for applications related to hydrology, forestry, and geology using a two-TV-camera system, and to conduct ocean-surface studies using a three-frequency satellite microwave radiometer (SAMIR) system. Secondary objectives were to test engineering and data processing systems, and to collect limited meteorological data from remote platforms. Bhaskara 2 was a 26-faced quasi-spherical polyhedron. It had a height of 1.66 m, and a diameter of 1.55 m. The satellite was named after the two "Bhaskaracharyas", astronomer-mathematicians of ancient India.

------- BHASKARA 2, BHANDARI---

INVESTIGATION NAME- THERMAL CONTROL COATING

NSSDC ID- 81-115A-04 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - D.R. BHANDARI ISRO SATELLITE CENTER

BRIEF DESCRIPTION
This investigation studied an indigenously developed thermal control coating for use in space.

------- BHASKARA 2, CALLA---

INVESTIGATION NAME- SATELLITE MICROWAVE RADIOMETER (SAMIR)

NSSDC ID- 81-115A-02 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
OCEANOGRAPHY

PERSONNEL
PI - O.P.N.CALLA SPACE APPLICATIONS CTR

BRIEF DESCRIPTION
The objectives of this investigation were to conduct studies over the Indian subcontinent and surrounding seas using a 19.35-, 22.235- and 31.0-GHz microwave radiometric system. The system monitored the changes in microwave radiation from the sea surface, yielding information on the sea state and the sea surface temperature.

------- BHASKARA 2, JOSEPH---

INVESTIGATION NAME- DUAL TV CAMERA

NSSDC ID- 81-115A-01 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL
PI - G. JOSEPH SPACE APPLICATIONS CTR

BRIEF DESCRIPTION
The objectives of this investigation were to conduct earth observation studies for applications related to hydrology, forestry, and geology using two television cameras operating in visible (0.54-0.66 micrometer) and near-infrared (0.75-0.85 micrometer) wavelengths. Each picture frame had an area of 325 x 325 km, with a resolution of 1 km.

------- BHASKARA 2, KAMAT---

INVESTIGATION NAME- DATA COLLECTION PLATFORM

NSSDC ID- 81-115A-05 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
COMMUNICATIONS

PERSONNEL
PI - D.S. KAMAT SPACE APPLICATIONS CTR
OI - S. PAL ISRO SATELLITE CENTER

BRIEF DESCRIPTION
This investigation was designed to collect meteorological data from remotely located platforms.

------- BHASKARA 2, MATHUR---

INVESTIGATION NAME- SOLAR CELL

NSSDC ID- 81-115A-03 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - R.S. MATHUR ISRO SATELLITE CENTER

BRIEF DESCRIPTION
This investigation studied indigenously developed solar cells for use in space.

*************************** DMSP 5D-2/F6 *********************

SPACECRAFT COMMON NAME- DMSP 5D-2/F6
ALTERNATE NAMES- DMSP BLOCK 5D-2, DMSP-F6
DMSP 5D-2/S6, 13736

NSSDC ID- 82-118A

LAUNCH DATE- 12/21/82 WEIGHT- 468. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS E

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 12/22/82
ORBIT PERIOD- 101.4 MIN INCLINATION- 98.7 DEG
PERIAPSIS- 817. KM ALT APOAPSIS- 839. KM ALT

PERSONNEL
MG - S. MCELROY USAF SPACE DIVISION

BRIEF DESCRIPTION
DMSP 5D-2/F6 was one of a series of meteorological satellites developed and operated by the Air Force under the Defense Meteorological Satellite Program (DMSP). This program, previously known as DAPP (Data Acquisition and Processing Program), was classified until March 1973. The objective of this program was to provide global visual and infrared cloudcover data and specialized environmental data to support Department of Defense requirements for operational weather analysis and forecasting. Operationally, the program consisted of two satellites in planned 830-km, sun-synchronous polar orbits, with the ascending node of one satellite in early morning and the other at local noon. The 6.4-m-long spacecraft was divided into four sections: (1) a precision mounting platform for sensors and equipment requiring precise alignment; (2) an equipment support module containing the electronics, reaction wheels, and some meteorological sensors; (3) a reaction-control-equipment support structure containing the spent third-stage rocket motor, and supporting the ascent-phase reaction-control equipment; and (4) a 9.29-sq-m solar cell panel. The spacecraft stabilization was controlled by a combination flywheel and magnetic control coil system so sensors were maintained in the desired "earth-looking" mode. One feature was the precision-pointing accuracy of the primary imager to 0.01 deg, provided by a star sensor and an updated ephemeris navigation system. This allowed automatic geographical mapping of the digital imagery to the nearest picture element. The operational linescan system was the primary data acquisition system that provided real-time or stored, multi-orbit, day-and-night, visual and infrared imagery. A supplementary sensor package contained four special sensors: (1) an infrared temperature/humidity sounder, (2) a scanning X-ray spectrometer, (3) an ionospheric plasma monitor, and (4) a precipitating electron/ion spectrometer. Either recorded or real-time data were transmitted to ground-receiving sites by two redundant S-band transmitters. Recorded data were read out to tracking sites located at Fairchild AFB, Washington, and at Loring AFB, Maine, and relayed by SATCOM to Air Force Global Weather Central, Offutt AFB, Nebraska. Real-time data were read out at mobile tactical sites located around the world. A more complete description of the satellite can be found in the report by D. A. Nichols, "The defense meteorological satellite program," Optical Engineering, v. 14, n. 4, July-August 1975.

------- DMSP 5D-2/F6, AFGWC STAFF-------------------------------

INVESTIGATION NAME- OPERATIONAL LINESCAN SYSTEM (OLS)

NSSDC ID- 82-118A-01 INVESTIGATIVE PROGRAM
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - AFGWC STAFF GLOBAL WEATHER CTR

BRIEF DESCRIPTION
The Operational Linescan System (OLS) was the primary experiment on the DMSP Block 5D spacecraft. The purpose of this experiment was to provide global day and night cloudcover observations and cloud temperature measurements. The OLS employed a scanning optical telescope driven in an oscillating motion, with optical compensation for image motion, which resulted in near-constant resolution throughout the sensor field of view. The radiometer operated in two ("light" and "thermal") spectral intervals: (1) visible and near infrared (0.4 to 1.1 micrometers) and (2) infrared (10.2 to 12.8 micrometers). The radiometer produced, with onboard processing, data in four modes: LF (light fine) and TF (thermal fine) data with a resolution of .56 km, and LS (light smoothed) and TS (thermal smoothed) data with a resolution of 2.8 km. There were four onboard recorders, each had a storage capability of 400 min of both LS and TS data or 20 min of LF and TF data. For direct readout to tactical sites, the experiment was programmed so that LF and TS data were obtained at night. The infrared data (TF and TS) covered a temperature range of 190 to 310 deg K with an accuracy of at best 2 deg K. The LS data mode provided visual data through a dynamic range from full sunlight down to a quarter moon. This mode also automatically adjusted the gain along the scan to allow useful data to be obtained across the terminator. Additional information on this experiment is contained in the report by D. A. Nichols, "Primary optical subsystems for DMSP Block 5D," Optical Engineering, v. 14, n. 4, July-August 1975.

------- DMSP 5D-2/F6, KOLASINSKI-------------------------------

INVESTIGATION NAME- SCANNING X-RAY SPECTROMETER (SSB/A)

NSSDC ID- 82-118A-03 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
AERONOMY

PERSONNEL
PI - A. KOLASINSKI AEROSPACE CORP

BRIEF DESCRIPTION
The primary objective of the scanning X-ray spectrometer, SSB/A, was to carry out studies in X rays, Lyman-alpha, and locally mirroring electrons. The instrument was composed of a high-energy and a low-energy scanning X-ray sensor, a Lyman-alpha sensor, and Geiger counters for monitoring electron background. The high-energy X-ray sensor consisted of three CdTe crystal detectors to measure X rays in the energy ranges 15 to 30 keV, 30 to 60 keV, 60 to 100 keV, and >100 keV. Each detector had an area of 1 sq cm and a 14-deg field of view. The low-energy X-ray sensor was a 3-atm single-wire proportional counter containing equal amounts of argon and xenon. It measured the flux of X-rays in 24 logarithmically spaced energy bands between 1.8 and 78 keV. This sensor had an effective area of 3.7 sq cm and a 5-deg (in track) by 10-deg (cross-track) field of view. The high- and low-energy X-ray sensors were mounted on separate scanning heads which scanned across the ground track through a 110-deg arc. A complete limb-to-limb scan took 10 s. The Lyman-alpha sensor detected prominent proton events. The two Geiger counters measured electron fluxes above 40 keV and 100 keV.

------- DMSP 5D-2/F6, ROTHWELL-------------------------------

INVESTIGATION NAME- PRECIPITATING ELECTRON/ION SPECTROMETER (SSJ/4)

NSSDC ID- 82-118A-05 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS

PERSONNEL
PI - P.L. ROTHWELL USAF GEOPHYS LAB

BRIEF DESCRIPTION
The primary purpose of the precipitating electron/ion spectrometer was to measure fluxes and energies of electrons and ions precipitated into the upper atmosphere. Particles were separated by an electrostatic analyzer into 20 energy bands from 30 eV to 30 keV: (1) 10 high-energy levels, at 0.948, 1.39, 2.04, 3.00, 4.40, 6.46, 9.48, 13.92, 20.44 and 30.00 keV; and (2) 10 low-energy levels, at 30.0, 44.0, 64.6, 94.9, 139.2, 204.4, 300, 440, 646, and 948 eV. Channeltrons were used to count the impinging electrons and ions in each energy band with particle flux accuracies of 1% and energy flux accuracies of 3.5%.

------- DMSP 5D-2/F6, SAGALYN-------------------------------

INVESTIGATION NAME- IONOSPHERIC PLASMA MONITOR (SSI/E)

NSSDC ID- 82-118A-04 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL
PI - R.C. SAGALYN USAF GEOPHYS LAB

BRIEF DESCRIPTION
The instrument consisted of one spherical (SEA) and one planar (PEA) electrostatic analyzer. The SEA provided measurements of electron densities from 10 to 1.E6 electrons/cc in the temperature range from 200 to 15,000 deg K. The PEA measured ion temperatures in the same range as well as the average ion mass over the range 1 to 35 u. The PEA was oriented in the direction of the positive spacecraft velocity.

************************** DMSP 5D-2/F7 **************************

SPACECRAFT COMMON NAME- DMSP 5D-2/F7
ALTERNATE NAMES- DMSP BLOCK 5D-2, DMSP-F7
DMSP 5D-2/S7

NSSDC ID- 83-113A

LAUNCH DATE- 11/18/83 WEIGHT- 468. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS E

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 11/29/83
ORBIT PERIOD- 101.3 MIN INCLINATION- 98.70 DEG
PERIAPSIS- 810. KM ALT APOAPSIS- 829. KM ALT

PERSONNEL
MG - S. MCELROY USAF SPACE DIVISION

BRIEF DESCRIPTION
DMSP 5D-2/F7 was one of a series of meteorological satellites developed and operated by the Air Force under the Defense Meteorological Satellite Program (DMSP). This program, previously known as DAPP (Data Acquisition and Processing Program), was classified until March 1973. The objective of this program was to provide global visual and infrared cloudcover data and specialized environmental data to support Department of Defense requirements. Operationally, the program consisted of two satellites in planned 830-km, sun-synchronous polar orbits, with the ascending node of one satellite in early morning and the other one at local noon. The 6.4-m-long spacecraft was divided into four sections: (1) a precision mounting platform for sensors and equipment requiring precise alignment; (2) an equipment support module containing the electronics, reaction wheels, and some meteorological sensors; (3) a reaction control equipment support structure containing the third-stage rocket motor and supporting the ascent phase reaction control equipment; and (4) a 9.29-sq-m solar cell panel. The spacecraft stabilization was controlled by a combination flywheel and magnetic control coil system so sensors were maintained in the desired "earth-looking" mode. One feature was the precision-pointing accuracy of the primary imager to 0.01 deg provided by a star sensor and an updated ephemeris navigation system. This allowed automatic geographical mapping of the digital imagery to the nearest picture element. The operational linescan system was the primary data acquisition system that provided real-time or stored, multi-orbit, day-and-night, visual and infrared imagery of the clouds. A supplementary sensor package contained six special sensors: (1) a microwave temperature sounder, (2) an X-ray spectrometer, (3) an ionospheric plasma monitor, (4) a precipitating electron/ion spectrometer, (5) a magnetometer, and (6) a space radiation dosimeter. Either recorded or real-time data were transmitted to ground-receiving sites by two redundant S-band transmitters. Recorded data were read out to tracking sites located at Fairchild AFB, Washington, and at Loring AFB, Maine, and relayed by SATCOM to Air Force Global Weather Central, Offutt AFB, Nebraska. Real-time data were read out at mobile tactical sites located around the world. A more complete description of the satellite can be found in the report by D. A. Nichols, "The defense meteorological satellite program," Optical Engineering, v. 14, n. 4, July-August 1975.

------- DMSP 5D-2/F7, AFGWC STAFF-------------------------------

INVESTIGATION NAME- OPERATIONAL LINESCAN SYSTEM (OLS)

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NSSDC ID- 83-113A-01   INVESTIGATIVE PROGRAM
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - AFGWC STAFF   GLOBAL WEATHER CTR

BRIEF DESCRIPTION

The Operational Linescan System (OLS) was the primary experiment on the DMSP Block 5D spacecraft. The purpose of this experiment was to provide global day and night observations of cloud cover and measurements of cloud top and sea surface temperatures and scene albedo. The OLS employed a scanning optical telescope driven in an oscillating motion, with optical compensation for image motion, which resulted in near-constant resolution throughout the sensor field of view. The radiometer operated in two ("light" and "thermal") spectral intervals: (1) visible and near infrared (0.4 to 1.1 micrometers) and (2) infrared (10.2 to 12.8 micrometers). The radiometer produced, with onboard processing, data in four modes: LF (light fine) and TF (thermal fine) data with a resolution of .56 km, and LS (light smoothed) and TS (thermal smoothed) data, with a resolution of 2.8 km. There were four onboard recorders, and each had a storage capability of 400 min of both LS and TS data or 20 min of LF and TF data. For direct readout to tactical sites, the experiment was programmed so that LF and TS data were obtained at night. The infrared data (TF and TS) cover a temperature range of 190 to 310 deg K with an accuracy of at best 2 deg K. The LS data mode provided visual data through a dynamic range from full sunlight down to a quarter moon. This mode also automatically adjusted the gain along the scan to allow useful data to be obtained across the terminator. Additional information on this experiment is contained in the report by D. A. Nichols, "Primary optical subsystems for DMSP Block 5D," Optical Engineering, v. 14, n. 4, July-August 1975.

------- DMSP 5D-2/F7, AFGWC STAFF-------------------------------

INVESTIGATION NAME- MICROWAVE TEMPERATURE SOUNDER (SSM/T)

NSSDC ID- 83-113A-03   INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - AFGWC STAFF   GLOBAL WEATHER CTR

BRIEF DESCRIPTION

The microwave temperature sounder, SSM/T, was a seven-channel scanning radiometer which measured radiation in the 5- to 6-mm wavelength (50- to 60-GHz) region, (specifically 50.5, 53.2, 54.35, 57.9, 58.4, 58.825, and 59.4 GHz) to provide data on the vertical temperature profile from the earth's surface to above 30 km. The SSM/T provided temperature soundings at higher altitudes and over cloudy regions inaccessible to an infrared temperature and moisture sounder. By choosing frequencies with different absorption coefficients on the wing of the oxygen absorption band, a series of weighting functions peaking at preselected altitudes was obtained. The radiometer scanned across the nadir track on seven scan positions and two calibration positions (cold sky and 300 deg K). The dwell time for the crosstrack and calibration positions was 2.7 s each. The total scan period was 32 s. The instrument had an instantaneous field of view of 12 deg and scanned plus or minus 36 deg from the nadir.

------- DMSP 5D-2/F7, AFGWC STAFF-------------------------------

INVESTIGATION NAME- SPACE RADIATION DOSIMETER (SSJ*)

NSSDC ID- 83-113A-07   INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - AFGWC STAFF   USAF GEOPHYS LAB

BRIEF DESCRIPTION

The primary purpose of the space radiation dosimeter was to measure the radiation dose above desired thresholds in silicon under aluminum shielding of four thicknesses representative of the Block 5D DMSP spacecraft. The instrument consisted of four detectors mounted beneath hemispherical domes of different thicknesses. Each detector was a pin-diffused junction silicon diode. The dosimeter directly measured the ionization in the silicon cube caused by natural radiation and served as an electron-proton spectrometer, thus yielding the integral fluxes of energetic electrons and protons encountered in the orbit as a function of time. The energy thresholds for measured electrons by different dome sensors were 1.0, 2.5, 5.0 and 10.0 MeV, and those for protons were 20, 35, 51, and 75 MeV. The radiation dose and the energetic electron flux obtained in this experiment may result in an optimization of space radiation-shielding design to protect sensitive electronics components.

------- DMSP 5D-2/F7, ROTHWELL-------------------------------

INVESTIGATION NAME- PRECIPITATING ELECTRON/ION SPECTROMETER (SSJ/4)

NSSDC ID- 83-113A-05   INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS

PERSONNEL
PI - P.L. ROTHWELL   USAF GEOPHYS LAB

BRIEF DESCRIPTION

The primary purpose of the precipitating electron/ion spectrometer was to measure fluxes and energies of electrons and ions precipitated into the upper atmosphere. Particles were separated by an electrostatic analyzer into 20 energy bands from 30 eV to 30 keV: (1) 10 high-energy levels, 0.948, 1.39, 2.04, 3.00, 4.40, 6.46, 9.48, 13.92, 20.44 and 30.00 keV; and (2) 10 low-energy levels, 30.0, 44.0, 64.6, 94.9, 139.2, 204.4, 300, 440, 646, and 948 eV. Channeltrons were used to count the impinging electrons and ions in each energy band with particle flux accuracies of 1% and energy flux accuracies of 3.5%.

------- DMSP 5D-2/F7, SAGALYN-------------------------------

INVESTIGATION NAME- IONOSPHERIC PLASMA MONITOR (SSI/E)

NSSDC ID- 83-113A-04   INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS

PERSONNEL
PI - R.C. SAGALYN   USAF GEOPHYS LAB

BRIEF DESCRIPTION

The instrument consisted of one spherical (SEA) and one planar (PEA) electrostatic analyzer. The SEA provided measurements of electron densities from 10 to 1.E6 electrons/cc in the electron temperature range from 200 to 15,000 deg K. The PEA measures ion temperatures in the same range as well as the average ion mass over the range 1 to 35 u. The PEA was oriented in the direction of the positive spacecraft velocity.

------- DMSP 5D-2/F7, SAGALYN-------------------------------

INVESTIGATION NAME- MAGNETOMETER (SSM)

NSSDC ID- 83-113A-06   INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - R.C. SAGALYN   USAF GEOPHYS LAB

BRIEF DESCRIPTION

The primary purpose of the magnetometer experiment was to obtain the components of magnetic field transverse to the main geomagnetic field at high latitudes which are associated with auroral field-aligned currents. The instrument consisted of (1) a triaxial fluxgate magnetometer with a fixed Z-axis sensor and adjustable X- and Y-axis sensors and (2) a signal processor to provide data at a 15-nT resolution over the range of 0 to 60,000 nT.

------- DMSP 5D-2/F7, SHRUM-------------------------------

INVESTIGATION NAME- X-RAY DETECTOR (SSB/S)

NSSDC ID- 83-113A-08   INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
AERONOMY
PARTICLES AND FIELDS

PERSONNEL
PI - J. SHRUM   USAF TECH APPL CTR

BRIEF DESCRIPTION

The primary purpose of the X-ray detector, SSB/S, was to detect nuclear debris from nuclear detonations. The instrument consisted of three sensors. Two of the sensors were arrays of four 1-cm-diameter CdTe detectors which sensed X rays in the four energy bands >45 keV, >75 keV, >115 keV, and >165 keV. The third sensor was a NaI detector which sensed scintillation. Rotating the sensor assembly caused all three sensors to scan across the ground track.

**************************** DYNAMICS EXPLORER 1**************

SPACECRAFT COMMON NAME- DYNAMICS EXPLORER 1
ALTERNATE NAMES- DE-A, DE 1
DYNAMICS EXPLORER-A

NSSDC ID- 81-070A

LAUNCH DATE- 08/03/81 WEIGHT- 409. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 08/03/81
ORBIT PERIOD- 410.8 MIN INCLINATION- 89.9 DEG
PERIAPSIS- 567.6 KM ALT APOAPSIS- 23289. KM ALT

PERSONNEL
MG - M.A. CALABRESE NASA HEADQUARTERS
SC - J.T. LYNCH NASA HEADQUARTERS
PM - J.P. CORRIGAN NASA-GSFC
PS - R.A. HOFFMAN NASA-GSFC

BRIEF DESCRIPTION

The general objective of the Dynamics Explorer (DE) mission was to investigate the strong interactive processes coupling the hot, tenuous, convecting plasmas of the magnetosphere and the cooler, denser plasmas and gases corotating in the earth's ionosphere, upper atmosphere, and plasmasphere. Two satellites, DE 1 and DE 2, were launched together and were placed in polar coplanar orbits, permitting simultaneous measurements at high and low altitudes in the same field-line region. The DE 1 spacecraft (high-altitude mission) used an elliptical orbit selected to allow (1) measurements extending from the hot magnetospheric plasma through the plasmasphere to the cool ionosphere; (2) global auroral imaging, wave measurements in the heart of the magnetosphere, and crossing of auroral field lines at several earth radii; and (3) measurements for significant periods along a magnetic field flux tube. The spacecraft approximated a short polygon 137 cm in diameter and 115 cm high. The antennas in the X-Y plane were 200-m tip-to-tip, and on the Z-axis were 9-m tip-to-tip. Two 6-m booms were provided for remote measurements. Power was supplied by a solar cell array, mounted on the side and end panels. The spacecraft was spin stabilized. The spin axis was in the orbital plane and the spin rate was 10 plus or minus 0.1 rpm. A pulse code modulation (PCM) telemetry data system was used that operated in real time or in a tape-recorder mode. Data were acquired on a science-problem-oriented basis, with closely coordinated operations of the various instruments, both satellites, and supportive experiments. Data acquired from the instruments were temporarily stored on tape recorders before transmission at an 8:1 playback-to-record ratio. Additional operational flexibility allowed a playback-to-record ratio of 4:1. The primary data rate was 16,384 bits per second. Since commands were stored in a command memory unit, spacecraft operations were not real time, except for the transmission of the wideband analog data from the Plasma Wave Instrument (81-070A-02). Additional details may be found in R. A. Hoffman et al., Space Sci. Instrum., v. 5, n. 4, p. 349, 1981. Dynamics Explorer 1 has a guest investigator program. A list of the participants, their affiliations, and the titles of their investigations appears in Appendix B2.

------- DYNAMICS EXPLORER 1, CHAPPELL--------------------------

INVESTIGATION NAME- RETARDING ION MASS SPECTROMETER

NSSDC ID- 81-070A-04 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
IONOSPHERES

PERSONNEL
PI - C.R. CHAPPELL NASA-MSFC
OI - P.M. BANKS STANFORD U
OI - W.B. HANSON U OF TEXAS, DALLAS
OI - J.H. HOFFMAN U OF TEXAS, DALLAS
OI - A.F. NAGY U OF MICHIGAN
OI - G.R. CARIGNAN U OF MICHIGAN

BRIEF DESCRIPTION

The Retarding Ion Mass Spectrometer (RIMS) consisted of a retarding potential analyzer for energy analysis in series with a magnetic ion-mass spectrometer for mass analysis. Multiple sensor heads permitted the determination of the thermal plasma flow characteristics. This instrument was designed to operate in two basic commandable modes: a high-altitude mode in which the density, temperature, and bulk-flow characteristics of principally H+, He+, and O+ ions were measured; and a low-altitude mode that concentrated on the composition in the 1- to 32-u range. This investigation provided information on (1) the densities of H+, He+, and O+ ions in the ionosphere, plasmasphere, plasma trough, and polar cap (including the density distribution along the magnetic vector in the vicinity of the satellite apogee); (2) the temperature of H+, He+, and O+ ions in the ionosphere, plasmasphere, plasma trough, and polar cap (energy range 0-45 eV); (3) the bulk flow velocities of H+, He+, and O+ in the plasmapause, plasma trough and polar cap; (4) the changing character of the cold plasma density, temperature, and bulk flow in regions of interaction with hot plasma such as at the boundary between the plasmasphere and the ring current; and (5) the detailed composition of ionospheric plasma in the 1-to 32-u range. He++ and O++ were also measured. The instrument consisted of three detector heads. One looked out in the radial direction, and the other two were along the plus and minus spin-axis directions. Each detector had a 55-deg half-cone acceptance angle. The detector heads had a gridded, weakly collimating aperture where the retarding analysis was performed, followed by a parallel plate ceramic magnetic mass analyzer with two separate exit slits corresponding to ion masses in the ratio 1:4. Ions exiting from these slits were detected with electron multipliers. In the apogee mode, the thermal particle fluxes were measured while the potential on a set of retarding grids was stepped through a sequence of settings. In the perigee mode, the retarding grids were grounded and the detector utilized a continuous acceleration potential sweep that focused the mass ranges from 1 to 8, and 4 to 32 u. Additional details can be found in C. R. Chappell et al., Space Sci. Instrum., v. 5, n. 4, p. 477, 1981.

------- DYNAMICS EXPLORER 1, FRANK----------------------------

INVESTIGATION NAME- GLOBAL AURORAL IMAGING AT VISIBLE AND ULTRAVIOLET WAVELENGTHS

NSSDC ID- 81-070A-03 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY
IONOSPHERES
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - L.A. FRANK U OF IOWA
OI - K.L. ACKERSON U OF IOWA
OI - R.L. CAROVILLANO BOSTON COLLEGE
OI - R.H. EATHER BOSTON COLLEGE

BRIEF DESCRIPTION

The Spin-Scan Auroral Imager (SAI) provided global auroral imaging at visible and ultraviolet wavelengths. It acquired (1) images at several visible wavelengths; (2) images within a vacuum ultraviolet "window", which allowed usable imaging of the aurora in the sunlit ionosphere; and (3) photometric measurements of the hydrogen corona. This investigation provided data that advanced the knowledge of (1) the spatial and temporal character of the entire auroral oval at both visible and vacuum ultraviolet wavelengths (with good time resolution); (2) the association of auroral and magnetospheric plasmas with the diverse auroral emission features; (3) the relationship of th auroral emissions with field-aligned currents; (4) the energy deposited in the auroral ionosphere by charged particles; (5) the acceleration mechanism responsible for "inverted-V" precipitation events; (6) the role of the polar cap and magnetotail in auroral and magnetospheric dynamics; and (7) the time-dependent distribution of neutral hydrogen in the ring current and polar regions. Of the three photometers, two measured radiation in the visible wavelength range and one measured it in the UV. A full image was 36 deg by 120 deg. Some of the wavelengths were 3914, 5577, 6300, 3175, 1304, 1216, 1400-1600, and 1400-1700 A. The spatial resolution of a pixel (picture element) at auroral altitudes in the nadir direction was 28 km at a spacecraft altitude of 1 earth radius (Re). At 3.9 Re altitude this resolution was 109 km. For each photometer, th time resolution was minutes per image. For visible wavelengths, the photometers had a wide-angle collimator; a super-reflecting scanning mirror; a mirror-drive motor; a quartz field lens; an image-viewing assembly of field-stop, pinhole and collimating lens; a filter wheel with narrow-band interference filters; and a small photomultiplier tube with an extended red photocathode. The vacuum ultraviolet imaging photometer was a spin-scan Newtonian telescope. The first optical element was an aluminum scanning mirror with a MgF2 overcoat. The collimation and mirror drive were similar to that used for the visible imaging photometer. A filter wheel with MgF2, CaF2, and BaF2 filters allowed global imaging from 1370 to 1700, and at 1304, 1356, and 1216 A. The detector was a photomultiplier tube with a CsI photocathode and a MgF2 window. Additional details are found in L. A. Frank et al., Space Sci. Instrum., v. 5, n. 4, p. 369, 1981.

------- DYNAMICS EXPLORER 1, HELLIWELL------------------------

INVESTIGATION NAME- CONTROLLED AND NATURALLY OCCURRING WAVE PARTICLE INTERACTIONS

NSSDC ID- 81-070A-08 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES AND RADIO PHYSICS
MAGNETOSPHERIC PHYSICS

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PERSONNEL

PI - R.A.	HELLIWELL	STANFORD U
OI - T.F.	BELL	STANFORD U
OI - D.L.	CARPENTER	STANFORD U
OI - C.G.	PARK	CORNELL U
OI - J.B.	REAGAN	LOCKHEED PALO ALTO

BRIEF DESCRIPTION

This investigation used a ground-based very-low-frequency/low-frequency (VLF/LF) (0.5-200 kHz) transmitter located at Siple, Antarctica, at an L value of about 4, and the broad-band magnetic field detector from experiment 81-070A-02. The primary objective of the investigation was to determine the relationship between VLF/LF waves and energetic electrons in the magnetosphere, with emphasis on wave growth, stimulated emissions, and wave-induced perturbations of the energetic electrons. Other objectives were (1) to determine how wave propagation from both ground and magnetospheric sources was affected by field-aligned plasma structures such as the plasmapause and ducts of enhanced ionization, (2) to use the wave data to describe the structure of the plasmapause and the distribution of ionization along field-aligned ducts, and (3) to study the effects of earth power-line radiation and other VLF wave activity. The spacecraft instrumentation for this experiment consisted of the Linear Wave Receiver (LWR) provided by the Plasma Wave Instrument (81-070A-02). The LWR provided a waveform output with a 30-dB linear amplitude response for bands of 1.5-3.0, 3.11 plus or minus 7-1/2%, 3-6, or 10-16 kHz for a selected magnetic or electric sensor. This receiver was used to measure growth rates for waves stimulated by the Siple VLF transmitter or by natural wave phenomena. More details can be found in S. D. Shawhan et al., Space Sci. Instrum., v. 5, n. 4, p. 535, 1981.

------- DYNAMICS EXPLORER 1, MAGGS----------------------------

INVESTIGATION NAME- AURORAL PHYSICS

NSSDC ID- 81-070A-07 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
AERONOMY
PARTICLES AND FIELDS

PERSONNEL

PI - J.E.	MAGGS	U OF CALIF, LA
OI - C.F.	KENNEL	U OF CALIF, LA

BRIEF DESCRIPTION

The primary goal of this investigation was to use the results from other experiments, particularly 81-070A-03, to test theoretical models and to develop new ones, with emphasis on research areas related to auroral arcs, field-aligned currents, plasma wave turbulence associated with anomalous resistance, generation of auroral electron beams, production of kilometric and VLF hiss radiation, and spread-F. In addition, correlation studies were organized by selecting events that were interesting to the various investigators, and data reduction procedures were suggested to facilitate comparison and interpretation of the data.

------- DYNAMICS EXPLORER 1, SHAWHAN-------------------------

INVESTIGATION NAME- PLASMA WAVES

NSSDC ID- 81-070A-02 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - S.D.	SHAWHAN	U OF IOWA
OI - D.A.	GURNETT	U OF IOWA

BRIEF DESCRIPTION

The Plasma Wave Instrument (PWI) measured ac electric fields over the frequency range from 1 Hz to 2 MHz, and an amplitude range of 0.03 microvolt per meter to 100 mV per meter. Magnetic fields were measured from 1 Hz to 400 kHz over an approximately 100-dB range. The objectives of this investigation were to measure the spatial, temporal, spectral, and wave characteristics (particularly the Poynting vector component along the magnetic field line) and the wave polarization for extremely-low-frequency (ELF), very-low-frequency (VLF), and high-frequency (HF) noise phenomena. Of special interest were the auroral kilometric radiation and VLF hiss, and a variety of electrostatic waves that may cause field-aligned acceleration of particles. The investigation made use of the long dipole antennas in the spin plane and along the Z axis, and a magnetic loop antenna. A single-axis search coil magnetometer and a short electric antenna were included for low-frequency measurements and electrostatic noise measurements at short wavelengths. The electronics consisted of (1) a wideband/long baseline receiver with a bandwidth of 10 or 40 kHz in the range 0-2 MHz; (2) a sweep-frequency correlator, containing two sweep-frequency receivers and phase detectors, sweeping 100 Hz to 400 kHz in 32 s, and giving the phase between magnetic and electric components of the field; (3) a low-frequency correlator containing two filter receivers and phase detectors (eight filters in the range 1.78-100 Hz were swept in 8 s); (4) dc monitors that measured the voltage difference between the two sets of long dipole antennas; and (5) a linear wideband receiver, selectable from 1.5 to 3.0, 3 to 6, or 10 to 16 kHz bands. The wideband receiver was flown to transmit wideband waveform signals to the ground via an analog transmitter, so that detailed high-resolution frequency-time analysis could be performed. More details are found in S. D. Shawhan et al., Space Sci. Instrum., v. 5, n. 4, p. 535, 1981.

------- DYNAMICS EXPLORER 1, SHELLEY---------------------------

INVESTIGATION NAME- HOT PLASMA COMPOSITION

NSSDC ID- 81-070A-06 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - E.G.	SHELLEY	LOCKHEED PALO ALTO
OI - R.G.	JOHNSON	OF. OF SCI&TECH POLICY
OI - R.D.	SHARP	LOCKHEED PALO ALTO
OI - J.	GEISS	U OF BERNE
OI - P.X.	EBERHARDT	U OF BERNE
OI - H.	BALSIGER	U OF BERNE
OI - D.T.	YOUNG	LOS ALAMOS NAT LAB
OI - A.G.	GHIELMETTI	U OF BERNE
OI - B.A.	WHALEN	NATL RES COUNC OF CAN

BRIEF DESCRIPTION

The Energetic Ion Composition Spectrometer (EICS) had high sensitivity and high resolution, and covered the energy range from 0 to 17 keV per unit charge and the mass range from less than 1 to greater than 150 u/Q. This investigation provided data used in investigating the strong coupling mechanism between the magnetosphere and the ionosphere that results in large fluxes of energetic O+ ions being accelerated from the ionosphere and injected into the magnetosphere during magnetic storms. The properties of the minor ionic species such as He+ and He++ relative to the major constituents of the energetic magnetosphere plasma were also studied in order to evaluate the relative importance of the different sources of the plasma and of various energization, transport, and loss processes that may be mass-or charge-dependent. One of the primary objectives was to measure the energy and pitch angle distributions of the principal mass constituents (O+ and H+) of the upward flowing ions from the auroral acceleration region. An important area for study was the cusp region. The instrument was similar to one flown on the ISEE 1 satellite, and consisted of a curved-plate electrostatic energy analyzer, followed by a combined cylindrical electrostatic-magnetic mass analyzer. Open electron multipliers were used with pulse-amplitude discrimination as the mass analyzer detectors in order to improve the mass separation characteristics of the spectrometer. The energy resolution, (delta E)/E (internal), was 5%. The mas resolution M/(delta M) was less than or equal to 10 on the focus line. Additional details can be found in E. G. Shelly et al., Space Sci. Instrum., v. 5, n. 4, p. 443, 1981.

------- DYNAMICS EXPLORER 1, SUGIURA--------------------------

INVESTIGATION NAME- MAGNETIC FIELD OBSERVATIONS

NSSDC ID- 81-070A-01 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - M.	SUGIURA	NASA-GSFC
OI - B.G.	LEDLEY	NASA-GSFC
OI - W.H.	FARTHING	NASA-GSFC
OI - L.J.	CAHILL, JR.	U OF MINNESOTA

BRIEF DESCRIPTION

This investigation used a triaxial fluxgate magnetometer (MAG-A), similar to one on board DE 2, to obtain vector magnetic field data needed to study the magnetosphere-ionosphere-atmosphere coupling. The primary objective of this investigation was to obtain measurements of field-aligned currents in the auroral oval and over the polar cap at two different altitudes. This was accomplished using the two spacecraft and correlations of these measurements with observations of electric fields, plasma waves, suprathermal particles, thermal particles, and auroral images obtained from investigation 81-070A-03. Ultra low frequency (ULF) waves were also studied. The magnetometer incorporated its own 12-bit analog-to-digital converter, a 4-bit digital compensation register for each axis, and a system control to generate a 48-bit data word consisting of a 16-bit representation of the field measured along each of the three magnetometer axes. Track and hold modules were used to obtain simultaneous samples on all three axes. Instrument bandwidth was 25 Hz. The instrument dynamic range was plus or minus 6.2E4 nT, and the resolution was plus or minus 1.5 nT in the 6.2E4 nT region,

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plus or minus 0.25 nT in the 1.E3 nT region, and plus or minus 0.02 nT in the 80 nT region. The magnetometer's digital compensation of the ambient field was nominally in 8.E3 nT increments. Further details are in W. H. Farthing et al., Space Sci. Instrum., v. 5, n. 4, p. 551, 1981.

**************************** ERBS ****************************

SPACECRAFT COMMON NAME- ERBS
ALTERNATE NAMES- EARTH RAD BUDGET SAT, ERBS-A
15354

NSSDC ID- 84-108B

LAUNCH DATE- 10/05/84 WEIGHT- 2250. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 12/11/84
ORBIT PERIOD- 96.8 MIN INCLINATION- 57. DEG
PERIAPSIS- 598. KM ALT APOAPSIS- 609. KM ALT

PERSONNEL
MG - D.S. DILLER NASA HEADQUARTERS
SC - R.A. SCHIFFER NASA HEADQUARTERS
PM - C.L. WAGNER, JR. NASA-GSFC
PS - M.D. KING NASA-GSFC

BRIEF DESCRIPTION
The Earth Radiation Budget Satellite (ERBS) was designed to be a 2-yr mission to gather required radiation budget data, aerosol data, and ozone data to assess climate change and ozone depletion. The two experiments were the Earth Radiation Budget Experiment (ERBE) and the Stratospheric Aerosol and Gas Experiment II (SAGE II). An ERBE is also carried on two TIROS-N series (NOAA 9 and NOAA-G) missions.

------- ERBS, COOPER -------

INVESTIGATION NAME- EARTH RADIATION BUDGET EXPERIMENT (ERBE)

NSSDC ID- 84-108B-01 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
ATMOSPHERIC PHYSICS

PERSONNEL
EM - J.E. COOPER NASA-LARC
TL - B.R. BARKSTROM NASA-LARC

BRIEF DESCRIPTION
The Earth Radiation Budget Experiment (ERBE) was designed to measure the energy exchange between the earth-atmosphere system and space. The measurements of global, zonal, and regional radiation budgets on monthly time scales helped in climate prediction and in the development of statistical relationships between regional weather and radiation budget anomalies. The ERBE consisted of two instrument packages: the non-scanner (ERBE-NS) instrument and the scanner (ERBS-S) instrument. The ERBE-NS instrument had five sensors, each using cavity radiometer detectors. Four of them were primarily earth-viewing: two wide field-of-view (FOV) sensors viewed the entire disk of the earth from limb to limb, approximately 135 deg; two medium FOV sensors viewed a 10-deg region. The fifth sensor was a solar monitor that measured the total radiation from the sun. Of the four earth-viewing sensors, one wide and one medium FOV sensors made total radiation measurements; the other two measured reflected solar radiation in the shortwave spectral band between 0.2 and 5 micrometers by using Suprasil-W filters. The earth-emitted longwave radiation component was determined by subtracting the shortwave measurement from the total measurement. The ERBE-S instrument was a scanning radiometer which contained three narrow FOV channels. One channel measured reflected solar radiation in the shortwave spectral interval between 0.2 and 5 micrometers. Another channel measured earth-emitted radiation in the longwave spectral region from 5 to 50 micrometers. The third channel measured total radiation with wavelength between 0.2 and 50 micrometers. All three channels were located within a continuously rotating scan drum which scanned the FOV across track sequentially from horizon to horizon. Each channel made 74 radiometric measurements during each scan, and the FOV of each channel was 3 by 4.5 deg that covered about 40 km at the earth's surface. The ERBE-S also viewed the sun for calibration. Additional information can be obtained from "Earth Radiation Budget Experiment (ERBE): An Overview," J. Energy, v. 6, pp. 141-146 (1982), by B. R. Barkstrom and J. B. Hall, Jr. See Appendix B3 for a list of ERBE investigators.

------- ERBS, MCCORMICK -------

INVESTIGATION NAME- STRATOSPHERIC AEROSOL AND GAS (SAGE)

NSSDC ID- 84-108B-02 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
UPPER ATMOSPHERE RESEARCH
ATMOSPHERIC PHYSICS

PERSONNEL
PI - M.P. MCCORMICK NASA-LARC
OI - L. MCMASTERS NASA-LARC
OI - W. VAUGHAN NASA-LARC

BRIEF DESCRIPTION
The SAGE sensor was a multi-spectral channel radiometer which measured the extinction of solar radiation intensity during solar occultation. As the spacecraft emerged from the earth's shadow during each orbit, the sensor acquired the sun and measured the solar intensity in seven wavelength bands centered between 0.385 and 1.0 micrometers as it scanned the sun vertically. As the spacecraft continued in orbit, the line of sight from the spacecraft to the rising sun scanned the earth's atmosphere, resulting in a measurement of the attenuated solar intensity at different atmospheric layers. The procedure was then repeated in a reverse sense during spacecraft sunset. Each sunrise or sunset event was monitored from the top of the clouds to approximately 150 km above the earth's surface. The sensor had an instantaneous field of view of approximately 0.5 km measured at the horizon for a 600-km orbit. The dynamic range of each radiometric channel was approximately 4000, and the uncertainty in any radiometric measurement was specified to be less than 0.1% of the unattenuated solar intensity (the sensor was partially self-calibrating in that a measurement of the unattenuated solar intensity was made prior to each spacecraft sunset and following each spacecraft sunrise). Furthermore, zero intensity levels were reached every time the elevation mirror scanned off the sun. The instrument module consisted of optical and electronic subassemblies mounted side by side. The optical subassembly consisted of a flat scanning mirror, Cassegrain optics, and a detector package. The entire optical subassembly was gimbaled in azimuth. The azimuth servo employed sun sensors driven to null on the center of the sun to a tolerance of plus or minus 1 arc-min. At the beginning of a sunrise or sunset event, the instrument slewed in azimuth to a position to acquire the sun. Upon acquisition in azimuth, the mirror servo scanned in elevation until the sun was acquired. The scan range was then reduced to scanning back and forth across the solar image only. The solar input was reflected from the scan mirror through the Cassegrain telescope, which produced a solar image upon the science detector aperture. This image was scanned across the aperture by the motion of the scan mirror. The radiation through the aperture was dispersed, and the beams representing the wavelength bands were then collected and applied to silicon pin diode detectors. The outputs of the detectors were fed to signal-conditioning amplifiers whose outputs went to the PCM encoder. The PCM encoder multiplexed and digitized the signals and then transferred the digital data to the ERBS data system. The radiometric data for each wavelength channel were sampled 64 times per second or approximately four times per kilometer of tangent altitude, and they were digitized to 12 bits. These data, plus science supporting data and instrument module housekeeping data, totalled approximately 6 kbps. See Appendix B for a list of SAGE-II investigators.

**************************** ESA-GEOS 2 ****************************

SPACECRAFT COMMON NAME- ESA-GEOS 2
ALTERNATE NAMES- 10981, GEOS 2

NSSDC ID- 78-071A

LAUNCH DATE- 07/14/78 WEIGHT- 571.7 KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 08/06/78
ORBIT PERIOD- 1431.2 MIN INCLINATION- 0.772 DEG
PERIAPSIS- 35615.5 KM ALT APOAPSIS- 35774.1 KM ALT

PERSONNEL
PM - D.E. MULLINGER ESA-ESTEC
PS - K. KNOTT ESA-ESTEC

BRIEF DESCRIPTION
ESA-GEOS 2 was the first spacecraft dedicated completely to scientific measurements in an equatorial geostationary orbit. The spacecraft served as a core or reference spacecraft for the International Magnetospheric Study (IMS) and carried out correlative measurements with extensive ground-based networks in Scandinavia. The payload consisted of instruments to measure (1) dc and ac electric and magnetic fields; (2) gradient of the magnetic field; (3) thermal and suprathermal plasma parallel and perpendicular to the magnetic field; (4) energy spectra, angular distribution, and composition of positive ions; and (5) angular distribution and energy spectra of energetic electrons and protons. In the NSSDC experiment descriptions which follow, ESA Exp. S-300 is described as five

separate experiments: 78-071A-05, -06, -07, -10, and -11. The spacecraft was cylindrical with a height of 1.321 m. The total mass, excluding propellants, was 273.6 kg. There were four telescopic axial booms 2.5 m in length for the wire mesh spheres of an ac electric field experiment, two 20-m cable booms for magnetic and electric field sensors and for an excitation antenna for plasma resonances, and two locking radial booms 3 m in length for a variety of instruments. There were six hydrazine thrusters: two to tilt and precess the spacecraft, two to modify the orbit so the longitude of the apogee could be changed, and two for spin up and spin down. The spin rate was nominally 10 rpm. Data were telemetered in real time at 137.2 MHz (186 and 744 bps) and at 2299.5 MHz (11.91 or 95.25 kbs). Attitude measurements were obtained by a sun sensor, a dual infrared earth sensor, and accelerometers. Power was supplied by 7200 solar cells mounted on the spacecraft surface. To prevent spacecraft differential charging, 96% of the surface was electrically conductive. Because of the importance of the magnetic field measurements, the spacecraft residual field at the magnetometer was only 0.3 nT. Except for minor modifications to certain experiments, this spacecraft and its instruments were identical to ESA-GEOS 1 (77-029A). More detailed information can be found in ESA Bulletin, n. 9, May 1977. Because one solar panel developed a short circuit soon after launch, a number of the experiments were able to obtain useful data for only one-half of the spin period.

------- ESA-GEOS 2, BEGHIN---

INVESTIGATION NAME- WAVE FIELD IMPEDANCE

NSSDC ID- 78-071A-11 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

PI - C.	BEGHIN	CNRS, CTR FOR SPECTROM
OI - P.	DECREAU	CNRS, CTR FOR SPECTROM

BRIEF DESCRIPTION

This investigation was part of ESA experiment S-300 and made use of one set of mesh electric spheres mounted on the end of the axial booms (part of 78-071A-10, Ungstrup) and the two vitreous carbon spheres mounted on the end of the 20-m radial booms (78-071A-07, Pedersen). The mesh spheres were used as transmitting elements for frequencies from 0.2 to 76 kHz. The self-impedance of these spheres and the mutual impedance between the mesh and long-boom carbon spheres were measured. Strong resonances at the hybrid resonance frequencies and anti-resonances at the gyro frequencies were used to determine the density of the surrounding plasma. Frequencies up to 450 Hz were telemetered directly, and sweep-frequency analyzers and digital correlation were employed to obtain the auto- and/or cross-correlation up to 77 kHz with selectable bandwidths of 2.5, 5.0, or 10.0 kHz.

------- ESA-GEOS 2, GEISS---

INVESTIGATION NAME- LOW-ENERGY ION COMPOSITION

NSSDC ID- 78-071A-03 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - J.	GEISS	U OF BERNE
PI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - P.X.	EBERHARDT	U OF BERNE
OI - H.	BALSIGER	U OF BERNE
OI - A.G.	GHIELMETTI	U OF BERNE
OI - H.	LOIDL	MPI-EXTRATERR PHYS
OI - D.T.	YOUNG	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

This instrument (ESA experiment S-303) measured the energy, angular distribution, and composition of positive ions using a cylindrical electrostatic analyzer (ESA) followed by a crossed electric and magnetic field analyzer (CFA) to select the energy and velocity. The energy (per unit charge) ranged from 0.001 to 17.2 keV in 32 steps with a delta E/E of 0.03 and a mass range of 1 to 140 u in 64 logarithmically spaced steps. There was a thermal mode in which a retarding grid in the entrance slit was used for analysis below 0.1 keV. All particles that overcame this grid voltage were accelerated to 3 keV before entering the ESA in its lowest energy step, where both the ESA and CFA were transparent. The device was aimed perpendicular to the spin or Z axis. For low-energy ions, the acceptance angles were plus or minus 6 deg in azimuth and plus or minus 30 deg in elevation (referenced to the Z axis). For the highest energies, these angles decreased to 3.5 and 7.1 deg, respectively. Three percent of the ions leaving the ESA were counted by a channeltron. The remaining 97% entered the CFA and the output was detected by an electron multiplier. This signal was pulse-height analyzed by one fixed and one variable discriminator to obtain better mass discrimination. The main purpose of this investigation was to identify the sources of low-energy particles in the magnetosphere. Time variations of the helium/hydrogen ratio, the degree of ionization of helium and oxygen, and the isotopic abundance ratio of helium 3/helium 4 could be measured to determine these sources. For additional details, see J. Geiss et al., Space Sci. Rev., v. 22, p. 537, 1978.

------- ESA-GEOS 2, GENDRIN---

INVESTIGATION NAME- MAGNETIC WAVE FIELDS

NSSDC ID- 78-071A-06 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - R.E.	GENDRIN	CNET
OI - J.M.	ETCHETO	CNET
OI - E.	UNGSTRUP	DANISH SPACE RES INST

BRIEF DESCRIPTION

The instrument used two sets of three-axis search coil magnetometers, one for the ULF/ELF range (0.1 to 450 Hz) and one for the VLF range (0.3 to 30 kHz). Each search coil consisted of a high-permeability material with a high-density pick-up winding. Each set of the three coils was built into a single assembly and mounted on the locking 3-m booms at a distance of 2 m from the spacecraft. Typical sensitivities of these sensors in units of nT per sq root of Hz, were 1E-1 at 0.1 Hz, 2E-4 at 10 Hz, and about 3E-6 at 1 kHz. These sensors and some associated electronics consisting of (1) a large number of channel-selection switches, (2) a number of bandpass filters, (3) six swept-frequency analyzers (SFA), (4) a digital correlator, and (5) eight stepped-gain amplifiers, were a part of the ESA wave experiment S-300. These components were employed for the sensors described in 78-071A-07 (Pedersen) and 78-071A-10 (Ungstrup), and also the investigations described in 78-071A-05 (Petit) and 78-071A-11 (Beghin). Six analog channels of 450-Hz bandwidth and the digital correlator output were transmitted by the 95.25-kbs telemetry mode. The SFA covered the frequency range up to 77 kHz in 256 partly overlapping steps. The correlator provided an auto-correlogram of 128 points within 29 ms. Its bandwidth could be selected to be 2.5, 5.0, or 10.0 kHz. A cross-correlogram between two sensors could be provided. The correlator also operated in a time-sharing mode between auto- and cross-correlation. For additional details, see Perraut et al., Space Sci. Rev., v. 22, p. 347, 1978.

------- ESA-GEOS 2, HULTQVIST---

INVESTIGATION NAME- LOW-ENERGY ELECTRON AND PROTON PITCH ANGLE DISTRIBUTION

NSSDC ID- 78-071A-04 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

PI - B.K.G.	HULTQVIST	KIRUNA GEOPHYS INST
OI - H.	BORG	KIRUNA GEOPHYS INST
OI - L.A.	HOLMGREN	KIRUNA GEOPHYS INST

BRIEF DESCRIPTION

This instrument (ESA experiment S-310) measured the energy and pitch-angle distribution of electrons and protons in the energy range 0.2 to 20 keV with extensive angular coverage concentrated in the loss-cone region. The purpose of the investigation was to improve the understanding of auroral particle acceleration and precipitation mechanisms by comparing near-equatorial particle distributions with coordinated ground-based observations at the foot of the magnetic field line. High temporal and spatial resolutions were provided to study wave-particle interactions. The experiment of Wilken (78-071A-01) was complementary to this one, extending both electron and proton observations to high energy ranges. A total of 10 curved-plate analyzers with channel electron multipliers for particle detection were used. Although normally eight analyzers were used to detect electrons and two to detect protons, a complex arrangement with four separate HV supplies allowed independent switching of four detector groups. The analyzing plate voltages could operate in a stepping mode, a sweeping mode, or a constant-voltage mode. In addition, the time accumulation could be varied with a nominal frame duration of 43 ms. However, this duration could be decreased by a factor of four at the expense of obtaining data from certain detectors in those cases where fast temporal variations were encountered in the loss cone. The energy intervals in the stepping mode consisted of 32 energy steps. The eight normal electron analyzers, with geometric factors (G) of 3E-4 sq cm-sr, consisted of four narrow-angle (2 deg x 2 deg, delta E/E of 0.11) and four wide-angle (8 deg x 7.5 deg, delta E/E of 0.09) devices. The two normal proton analyzers had delta E/E of 0.13, apertures of 6 deg x 3 deg, and G of 1E-3 sq cm-sr. Aperture angular widths refer to elevation and azimuth, respectively, in relation to the spacecraft spin axis. This experiment relied heavily on real-time ground computer control.

------- ESA-GEOS 2, MARIANI--

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETER

NSSDC ID- 78-071A-09 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - F.	MARIANI	U OF ROME
OI - M.	CANDIDI	CNR, SPACE PLASMA LAB
OI - D.H.	FAIRFIELD	NASA-GSFC
OI - E.	AMATA	CNR, SPACE PLASMA LAB

BRIEF DESCRIPTION

A triaxial fluxgate magnetometer was employed for simultaneous measurements of the three components of the magnetic field. The frequency range covered by the instrument extended from dc up to 5 Hz. In the normal orientation of the satellite, the main component of the field coincided with the Z axis of the instrument, which was aligned with the spin axis of the satellite. The experiment had been designed with two sensitivity ranges for the X and Y components, for which the magnetic field component was only a fraction of the total field and was modulated by the rotation of the spacecraft. This last feature made the range switch technique preferable to a bias offset technique. The two selected sensitivity ranges were plus or minus 60 nT and plus or minus 180 nT. Along the Z axis, where the field was higher and not modulated by the satellite rotation, a single sensitivity range of plus or minus 60 nT was used. The signal was kept within range by superimposing positive and negative bias levels of 60 nT each, such that a range plus or minus 480 nT with a constant quantization error of plus or minus 0.125 nT, using 9-bit digits, was obtained. The noise level of the sensors was comparable to this quantization error.

------- ESA-GEOS 2, MELZNER--

INVESTIGATION NAME- DC ELECTRIC FIELD AND GRADIENT B
ELECTRON BEAM DEFLECTION

NSSDC ID- 78-071A-08 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - F.	MELZNER	MPI-EXTRATERR PHYS
OI - H.J.	VOELK	MPI-NUCLEAR PHYS
OI - G.	METZNER	MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

The prime objective of this investigation (ESA experiment no. S-329) was the measurement of the dc electric field in the plane perpendicular to the local magnetic field (B). The investigation also measured the spatial gradient of B in the vicinity of the spacecraft. With these data, a mapping of the electric fields in the equatorial magnetosphere linked magnetically to the auroral zones could be achieved, as well as determining plasma convection and particle flow within the plasma sheet. The instrument consisted of four electron guns spaced logarithmically from the electron detector. Two of the guns were mounted on one of the 3-m radial booms. The guns were used one at a time to generate an electron beam of about 1.E-8 A and with energy of about 1 keV. Both parameters were varied by telecommand. Deflection plates associated with each gun received a sinusoidal signal from the magnetometer investigation to ensure that the beam was always at right angles to B, in spite of the angle of the spin vector to B. The electron detector consisted of deflection plates that removed the elevation correction given to the beam by the magnetometer signal, a curved plate energy filter, and a photomultiplier tube. Because the maximum displacement occurred when the beam made an angle of 0 or 180 deg to the electric field, all possible displacements less than this occurred twice during a spin period. Consequently, the beam swept across the detector twice per spin period, provided the maximum displacement was less than the distance between the gun and the detector. The values of the spin angle at which the beam was detected after one gyration, and the distance between the gun and receiver, allowed the determination of the electric field. A possible contribution from the gradient of B could be determined by varying the energy of the beam. The investigation relied entirely on real-time control by a ground-based computer. It had four basic modes of operation: search, adjustment, optimization, and normal. The search mode was designed to find the signal at nominal beam parameters. If this was not achieved, the adjustment mode was used to vary these parameters systematically. Once the beam was detected, the optimization mode determined the best compromise between beam current and received signal quality. Then the normal mode started, which consisted of a continuous measurement of the electric field and the gradient of B, using the most appropriate of the four guns. Tungsten filaments were used in the electron gun and the problems caused by the barium oxide filaments on ESA-GEOS 1 were not experienced. For additional details, see F. Meltzner and G. Metzner, Z. Flugwiss. Weltraumforsch., v. 1, p. 303, 1977.

------- ESA-GEOS 2, PEDERSEN--

INVESTIGATION NAME- DC FIELDS BY DOUBLE PROBE

NSSDC ID- 78-071A-07 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - A.	PEDERSEN	ESA-ESTEC
OI - D.	JONES	BRITISH ANTARCTIC SURV
OI - K.	KNOTT	ESA-ESTEC
OI - R.J.L.GRARD		ESA-ESTEC

BRIEF DESCRIPTION

This instrument (part of ESA Exp. S-300) consisted of two vitreous carbon spheres mounted at the tips of the 20-m cable booms, which extended radially from the spacecraft perpendicular to the spin axis. This investigation was concerned with the dc single-axis electric-field analysis. The two output signals were evaluated in terms of dc electric field and conditioned for further treatment in the analysis of ac electric fields. The output from one sphere was signal-conditioned on a linear scale; the differential output from the two spheres was compressed logarithmically. In addition, the two outputs were passed through 450-Hz to 77-kHz filters. These filtered signals were differenced and all three signals made available for analysis by the sweep-frequency analyzers and digital correlator as part of the 78-071A-05 (Petit), 78-071A-10 (Ungstrup), and 78-071A-01 (Beghin) investigations. The sensitivity of this probe was about 1E-4 V/m at dc and 1E-8 volts per meter per square root of Hz for ac. For additional details, see A. Pedersen et al., Space Sci. Rev., v. 22, p. 333, 1978.

------- ESA-GEOS 2, PETIT--

INVESTIGATION NAME- VLF PLASMA RESONANCES

NSSDC ID- 78-071A-05 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

PI - M.	PETIT	CNET
OI - J.M.	ETCHETO	CNET

BRIEF DESCRIPTION

This investigation (part of ESA experiment S-300) utilized the 20-m booms (normal to the spacecraft spin axis) as a dipole antenna, and the carbon spheres (part of 78-071A-07, Pedersen) as the receiving element. Frequencies from 0.3 to 77 kHz were employed. On transmission of a VLF signal of limited duration, a transient signal was observed for a much longer period than the pulse length, provided that the spectrum of the transmitted signal included one of the resonant frequencies of the plasma. The ambient plasma density was inferred from the determination of the resonant frequencies. Received frequencies up to 450 Hz were telemetered directly, and six sweep-frequency analyzers and a digital correlator provided auto- and cross-correlations up to 77 kHz. Bandwidths of 2.5, 5.0, or 10.0 kHz could be selected for the correlator.

------- ESA-GEOS 2, UNGSTRUP--

INVESTIGATION NAME- ELECTRIC WAVE FIELDS

NSSDC ID- 78-071A-10 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - E.	UNGSTRUP	DANISH SPACE RES INST
OI - A.	BAHNSEN	DANISH SPACE RES INST

BRIEF DESCRIPTION

This investigation was part of the ESA S-300 wave experiment and employed four mesh spheres mounted at the end of the 2.5-m axial booms. Differential measurements from these sensors provided the three vector components of the electric field. Frequencies from 50 Hz to 77 kHz were analyzed with the sweep-frequency analyzer and the digital correlator. Frequencies up to 450 Hz were telemetered directly, and auto- and/or cross-correlation of the sensor outputs up to 77 kHz was accomplished with selectable bandwidths of 2.5, 5.0, and 10.0 kHz. The sensitivity of the mesh sphere probes at 10 kHz was 1E-6 volts per meter per square root of Hz.

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OF POOR QUALITY

------- ESA-GEOS 2, WILKEN---

INVESTIGATION NAME- ELECTRON AND PROTON PITCH ANGLE DISTRIBUTION

NSSDC ID- 78-071A-01   INVESTIGATIVE PROGRAM SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - B.	WILKEN	MPI-AERONOMY
OI - G.	PFOTZER(DECEASED)	MPI-AERONOMY
OI - E.	KEPPLER	MPI-AERONOMY
OI - A.	KORTH	MPI-AERONOMY
OI - J.	MUENCH	MPI-AERONOMY

BRIEF DESCRIPTION

This instrument (ESA experiment S-321) measured the energy and pitch-angle distribution of higher energy electrons and protons than that of Hultqvist (78-071A-04), and was complementary to that instrument. The detector system consisted of two separate magnetic deflection spectrometers with two proton telescopes associated with each spectrometer. There were five rectangular solid-state detectors mounted along the focal line of each spectrometer to measure the electrons. Each spectrometer covered an angular aperture in elevation angle (relative to the spin axis) of 60 deg. The two deflection magnets were positioned so that elevation angles (referred to the spin axis) from 10 to 120 deg, on 10 deg centers, were covered for electrons, giving elevation angles of 23, 46, 83, and 106 deg for the proton telescopes. These telescopes consisted of a front, surface-barrier detector and a rear, solid-state detector. Electron energies from 30 to 200 keV and proton energies from 0.04 to 1.4 MeV were covered. The effective angular aperture for protons was 10 deg x 4 deg (elevation x azimuth) and for electrons was 6 deg x 4 deg. Geometric factors for protons and electrons were 5E-4 and 1E-4 sq cm-sr, respectively. A 12-channel pulse-height analyzer (PHA) for protons could be used for any one of the four front detectors, provided a front-rear coincidence was detected, and a 15-channel PHA could be used for any one of the 10 electron detectors. The singles rate for one of the four proton detectors and the coincidence rate from one of the four proton telescopes could be selected. There were three modes for data selection: mode 0, integral count rates and spectral measurements for all 14 detectors; mode 1, integral count rates and spectral measurements for four detectors (good time resolution of integral rates); and mode 2, integral count rates and spectral measurements (good time resolution for energy spectra). The minimum time for a complete spectrum was 688 ms; the minimum time for integral flux variations was 43 ms. The spectral measurements had a resolution, delta E/E, of 0.35. For additional details, see B. Wilken et al., Z. Flugwiss. Weltraumforsch., v. 1, p. 298, 1977.

------- ESA-GEOS 2, WRENN---

INVESTIGATION NAME- THERMAL PLASMA FLOW

NSSDC ID- 78-071A-02   INVESTIGATIVE PROGRAM SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

PI - G.L.	WRENN	MULLARD SPACE SCI LAB
OI - R.L.F.	BOYD(RETIRED)	U COLLEGE LONDON
OI - K.	NORMAN	MULLARD SPACE SCI LAB
OI - W.J.	RAITT	UTAH STATE U

BRIEF DESCRIPTION

This instrument (ESA experiment S-302) employed two hemispherical electrostatic analyzers mounted on one of the locking booms for the measurement of electrons or protons over the range 0.5 to 500 eV arriving close to parallel and close to perpendicular to the local magnetic field. The energy range was covered in 64 steps with a relative energy resolution of 0.11. One analyzer had its aperture pointing along the negative Z spin axis, with an opening angle of 18 deg x 18 deg providing a geometric factor (G) of 6E-4 sq cm-sr. The other analyzer made an angle of 100 deg with respect to the +Z axis, with an opening angle of 8 deg x 30 deg, providing a G of 5E-4 sq cm-sr. Both detectors had to measure the same type of particles at the same time. The collimators of these instruments could be set at any voltage from -28 to +32 V in steps of 0.1 V to compensate for the potential difference between the instrument and the undisturbed plasma environment. This voltage was used to determine the spacecraft potential. For additional details, see J. F. E. Johnson et al., Space Sci. Rev., v. 22, p. 567, 1978, and G. L. Wrenn et al., Space Sci. Instrum., v. 5, p. 271, 1981.

**************************** EXOSAT ****************************

SPACECRAFT COMMON NAME- EXOSAT
ALTERNATE NAMES- HI.ECCEN LUN OCCULT.SAT., EUROPEAN X-RAY OBS S
HELOS, 14095

NSSDC ID- 83-051A

LAUNCH DATE- 05/26/83   WEIGHT- 500. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA 3914

SPONSORING COUNTRY/AGENCY
INTERNATIONAL   ESA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 05/27/83
ORBIT PERIOD- 5435.4 MIN	INCLINATION- 72.5 DEG
PERIAPSIS- 347. KM ALT	APOAPSIS- 191709. KM ALT

PERSONNEL

PM - G.	ALTMANN	ESA-ESTEC
PS - R.D.	ANDRESEN	ESA-ESTEC
PS - A.	PEACOCK	ESA-ESTEC

BRIEF DESCRIPTION

The scientific mission of the European X-ray Observatory Satellite (EXOSAT) was to measure the position, structural features, and spectral and temporal characteristics of cosmic X-ray sources in the approximate range 0.04 to 80 keV. EXOSAT used two operational modes: (a) the occultation mode, for the precise determination and identification of sources and the observation of structural features, using the moon or the earth as the occulting body, and (b) the arbitrary pointing mode for the study of the temporal and spectral variability of sources over long uninterrupted time intervals and the mapping of low-energy sources. The observatory, placed in a highly eccentric orbit with its apogee at 200,000 km and at a high latitude, was capable of observing lunar occultations over 20% of the celestial sphere within a year. The positional accuracy of bright (>1E-2 photons/sq cm-s in the range >1.5 keV) sources was limited to about 1 arc-s by the inaccuracy of measurement of the position of the satellite and the uncertainty of the topography of the lunar limb. For weaker sources, the accuracy was limited by statistics; i.e., the total number of X-ray quanta received during the time of the corresponding angular displacement of the moon. When not engaged in occultation observations, the observatory could view the sky uninterruptedly in any chosen direction (except 60 deg about the solar direction) for as long as the orbital period was above the Van Allen belts (approximately 80 h). With accurate timekeeping on board, and with the capability of long continuous observation, EXOSAT could determine regular and irregular variations of the intensity of X-ray sources on a time scale ranging from tens of microseconds to tens of hours. The triaxial stabilized spacecraft was cylindrical with a diameter of 192 cm and a height of 117 cm. A rotatable solar array with an area of 3 sq m was mounted on top of the spacecraft. The star trackers were mounted on the optical benches of the two imaging telescopes to facilitate alignment and stability. In the occultation mode the observatory was able to view all of the celestial sphere except for a cone of half-angle 15 deg centered on the sun; in the arbitrary pointing mode the excluded cone was a cone of half-angle 60 deg, also centered on the sun. Consumables were distributed to enable some 100 orbital maneuvers for lunar occultation to be undertaken and over 2000 targets to be observed. The scientific payload was funded by ESA and its development managed by ESA. Use of the observatory was open to the scientific community following selection of observational proposals.

------- EXOSAT, BOYD---

INVESTIGATION NAME- LOW-ENERGY X-RAY IMAGING TELESCOPES

NSSDC ID- 83-051A-02   INVESTIGATIVE PROGRAM SCIENCE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

TL - R.L.F.	BOYD(RETIRED)	U COLLEGE LONDON
TM - P.W.	SANFORD	U COLLEGE LONDON
TM - B.N.	SWANENBURG	U OF LEIDEN
TM - J.A.M.	BLEEKER	U OF LEIDEN
TM - C.	DE JAGER	U OF UTRECHT
TM - A.C.	BRINKMAN	U OF UTRECHT

BRIEF DESCRIPTION

The instrument consisted of two identical X-ray imaging telescopes (LE1 and LE2) utilizing two nested grazing-incidence paraboloic/hyperbolic reflectors. The focal-plane assembly incorporated a gas-flow position-sensitive proportional counter and a channel-multiplier array, covering the energy range from 0.04 to 2 keV; this was limited by the reflecting optics. A transmission grating was located at the exit plane of the mirror for spectroscopic measurements. Each telescope had an FOV of 1 deg, a geometric collecting area of 90 sq cm, a mass of 30 kg, and consumed 5 W. Filters and a grating could be used to separate X-rays of different wavelengths.

------- EXOSAT, TAYLOR--

INVESTIGATION NAME- GAS SCINTILLATION X-RAY SPECTROMETER

NSSDC ID- 83-051A-03 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

TL - B.G.	TAYLOR	ESA-ESTEC
TM - R.D.	ANDRESEN	ESA-ESTEC
TM - R.L.F.	BOYD(RETIRED)	U COLLEGE LONDON
TM - P.W.	SANFORD	U COLLEGE LONDON
TM - L.	SCARSI	U OF PALERMO
TM - S.	SALENI	U OF PALERMO
TM - G.	BOELLA	U OF MILAN
TM - G.	VILLA	U OF MILAN
TM - A.	PEACOCK	ESA-ESTEC

BRIEF DESCRIPTION

A gas-scintillation proportional-counter spectrometer (GSPC) was used to study detailed spectral features in the energy range 2.5 to 50 keV. The device had an effective area of 250 sq cm and an energy resolution of 10% at 10 keV. The experiment FOV, defined by a mechanical collimator, was 45 arc-min FWHM. The counter window was a 175-micrometer thick beryllium foil and the gas cell was filled with a one-atmosphere mixture of 95% xenon and 5% helium. The GSPC had an X-ray collecting area of 200 sq cm, a mass of 8 kg, and consumed 5 W.

------- EXOSAT, TRUEMPER--

INVESTIGATION NAME- MEDIUM-ENERGY COSMIC X-RAY PACKAGE

NSSDC ID- 83-051A-01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

TL - J.	TRUEMPER	MPI-EXTRATERR PHYS
TM - H.	ZIMMERMAN	MPI-EXTRATERR PHYS
TM - R.	STAUBERT	U OF TUBINGEN
TM - K.A.	POUNDS	U OF LEICESTER
TM - M.	TURNER	U OF LEICESTER

BRIEF DESCRIPTION

The instrument consisted of a large area proportional counter (ME) array of argon-filled counters, backed up by xenon-filled counters with an effective area of 1,800 sq cm, covering the energy range from 1.2 to 50 keV. The array was divided into four sections, each of which could be offset from the pointing direction to provide for a variable flat-top collimator response. The detectors had FOVs of 1.5 deg with an energy resolution of 20% at 6 keV for argon and 22 keV for xenon. The ME had a mass of 48 kg and consumed 17 W.

************************** GEOS 3 **************************

SPACECRAFT COMMON NAME- GEOS 3
ALTERNATE NAMES- GEODETIC EXPLORER SAT, GEOS-C
GEODYNAM EXPT OCEAN SAT

NSSDC ID- 75-027A

LAUNCH DATE- 04/09/75 WEIGHT- 340. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 04/10/75
ORBIT PERIOD- 101.82 MIN INCLINATION- 114.96 DEG
PERIAPSIS- 839. KM ALT APOAPSIS- 853. KM ALT

PERSONNEL

MG - C.J.	FINLEY	NASA HEADQUARTERS
SC - J.P.	MURPHY	NASA HEADQUARTERS
PS - H.R.	STANLEY	NASA-GSFC-WFF

BRIEF DESCRIPTION

The GEOS 3 (Geodynamics Experimental Ocean Satellite) spacecraft was an octahedron, topped by a truncated pyramid, with a parabolic reflector for a radar altimeter on the flat bottom side. A metal ribbon boom with end mass extended upward approximately 6.1 m from the top of the pyramid. Passive laser retroreflector cubes were mounted in a ring around the parabolic reflector with the normal vector from each cube facing 45 deg outward from the direction of the earth. A turnstile antenna for VHF and UHF frequencies and separate antennae for earth-viewing 324-MHz Doppler, C-band, and S-band transponders were mounted separately on flat surfaces next to the parabolic reflector. The dimension across the flats of the octahedron was 1.22 m, and the spacecraft was 1.11 m high. The mission provided the stepping stone between the National Geodetic Satellite Program (NGSP) and the Earth and Ocean Physics Application Program. It provided data to refine the geodetic and geophysical results of the NGSP and served as a test for new systems. Mission objectives were to perform a satellite altimetry experiment in orbit, to support further the calibration and position determination of NASA and other agency C-band radar systems, and to perform a satellite-to-satellite tracking experiment with the ATS 6 spacecraft using an S-band transponder system. This system was also used for periodic GEOS 3 telemetry data relay through ATS 6, to support further the intercomparison of tracking systems, to investigate the solid-earth dynamic phenomena through precision laser tracking, to refine further orbit determination techniques and determine interdatum ties and gravity models, and to support the calibration and position determination of NASA Spaceflight Tracking and Data Network (STDN) S-band tracking stations. For more details, see special reports on the GEOS 3 in J. Geophys. Res., v. 84, n. B8, 1979.

------- GEOS 3, ANDERLE--

INVESTIGATION NAME- US NAVY DOPPLER SYSTEM

NSSDC ID- 75-027A-05 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION
GEODESY

PERSONNEL
PI - R.J. ANDERLE USN SURFACE WEAPNS CTR

BRIEF DESCRIPTION

The Doppler technique of timing and measuring the frequency shift of radio transmissions from a moving spacecraft was used to obtain data that further established the structure of the earth's gravitational field through the comparison of new and established geodetic measurements. Two transmitters were operated at frequencies of 162 and 324 MHz. The dual frequencies were coherently related and utilized in conjunction with ground Doppler receiving stations to obtain precision satellite range-rate data. The dual frequencies were generated by a highly stable oscillator driving two frequency multipliers. Both frequencies were used simultaneously to provide comparison data of the effect of the ionosphere on the signals. Thirteen or more fixed ground receiving stations operated by the U.S. Navy Doppler Tracking Network (TRANET) and 12 portable geoceivers operated by the U.S. Army, U.S. Navy, and U.S. Air Force, all under the direction of the Defense Mapping Agency (DMA) obtained data. Observations made from three or more known stations allowed deduction of orbital parameters. Range-rate data from either the fixed stations or the geoceivers were estimated to be accurate within 0.5 cm/s.

------- GEOS 3, JACKSON--

INVESTIGATION NAME- C-BAND SYSTEM

NSSDC ID- 75-027A-03 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION

PERSONNEL
PI - E.B. JACKSON NASA-GSFC-WFF

BRIEF DESCRIPTION

The objective of this experiment was to support the altimeter C-band system calibration as well as geometric, gravimetric, and other geodetic investigations. The C-band transponder subsystem consisted of two transponders: one, the GEOS 2 noncoherent type and the other, a coherent C-band transponder. The noncoherent transponder provided for range and angle measurements, while the coherent transponder provided for both range, range-rate, and angle measurements. Both transponders received signals at 5690 MHz. The coherent transponder transmitted at 5690 MHz, while the noncoherent type transmitted at 5765 MHz. Each C-band transponder transmitted one pulse for each coded group of pulses transmitted by a ground tracking C-band radar. The internal delay between the received ground-transmitted pulse code and the transponder-transmitted pulse was calibrated prior to launch. Each transponder (while operating separately or simultaneously) operated in either standby or override mode. In standby, the receiver became operational after approximately 60 s of interrogation, or long enough for the output tube to warm up. In override, the output tube filament was energized by the external command and the warm-up delay circuit bypassed after the tube warmed up, thus allowing the transponder to respond immediately to interrogation signals. This override mode reduced ground-command requirements and conserved spacecraft power.

------- GEOS 3, PURDY--

INVESTIGATION NAME- RADAR ALTIMETER SYSTEM

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NSSDC ID- 75-027A-01

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION
GEODESY
OCEANOGRAPHY

PERSONNEL
PI - C.L. PURDY NASA-GSFC-WFF

BRIEF DESCRIPTION

The radar altimeter was the highest priority experiment on GEOS 3. The objectives were (1) to determine the feasibility and utility of a spaceborne radar altimeter for mapping the topography of the ocean surface with an absolute accuracy within 5 m, and with a relative accuracy of 1 to 2 m, (2) to determine the feasibility of measuring the deflection of the vertical information at sea, (3) to determine the feasibility of measuring wave height, and (4) to contribute to the technology leading to a future operational altimeter-satellite system with a 10-cm measurement capability. To meet the experiment objectives, the altimeter had two distinct data-gathering modes: a long-pulse altimetry data mode and a short-pulse mode. Performance capabilities and operating characteristics of the altimeter differed for the two modes. Both modes operated on a 13.9-GHz frequency, used a parabolic antenna, had a maximum range acquisition time of 6 s, and had an altitude granularity of plus or minus 0.2 m. Differing characteristics were as follows: (1) altitude data rate for the long-pulse mode was two readings per second and for the short-pulse mode was six readings per second, and (2) input power for the long-pulse mode was 50 W and for the short-pulse mode was 100 W. The GEOS 3 radar altimeter had several features in common with the altimeter used on the Skylab spacecraft, but it had advantages over the Skylab altimeter because of improved accuracy and ability to operate over extended areas for greater periods of time, thereby providing the capability of examining the earth over longer arcs and observing extensive ocean areas. The third in the series of satellite altimeters was flown on Seasat 1. The system provided good quality data and demonstrated the capabilities more than originally anticipated. More details can be found in J. Geophys. Res., v. 84, . 88, 1979.

------- GEOS 3, SALZBERG---

INVESTIGATION NAME- S-BAND TRACKING SYSTEM

NSSDC ID- 75-027A-02

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION

PERSONNEL
PI - I.M. SALZBERG NASA-GSFC

BRIEF DESCRIPTION

The S-band transponder subsystem provided metric tracking data (range, range-rate). It transmitted telemetry data, but did not receive commands. The transponder operated in the following three modes: (1) satellite-to-satellite tracking (SST) from the Rosman or European ATS ground stations through ATS 6 to GEOS 3 and back (also see experiment 75-027A-06), (2) direct unified S-band (USB) (Doppler only) ground-station tracking of GEOS 3, and (3) direct GRARR (Goddard Range and Range Rate) ground-station tracking of GEOS 3. The transponder subsystem consisted of a single-channel transponder, a power amplifier, a diplexer, and an earth-viewing and ATS-viewing antenna system. The antennae were selectable by ground command. The earth-viewing antenna for direct tracking with the USB and GRARR ground stations had approximately hemispherical coverage and a minimum of 0-dB gain within 60 deg of the spacecraft Z axis. The SST antenna system consisted of an in-track array that provided a 3-dB gain in the direction of ATS for GEOS ascending and descending node passes, which crossed the equator within plus or minus 26 deg of the ATS subsatellite point. In the SST operation mode, the interrogation signal was first transmitted at C-band by the ATS ground station to the ATS 6 spacecraft. ATS 6 instrumentation coherently altered the signal, making it compatible with the input frequency (2069.1125 MHz) of the S-band transponder on GEOS 3, and transmitted the signal to GEOS 3. GEOS 3 then, after translating the received signal, retransmitted it to ATS 6 as if ATS 6 were another ground station. ATS 6 then retransmitted the signal to the ATS ground station at C-band. Range sum and range-rate sum were obtained by comparing the interrogation and response signals. The S-band on GEOS 3 was also tracked by the USB and GRARR STDN stations. Carrier frequencies (2069.1125 MHz up and 2247 MHz down) were identical to those of the SST mode. Coherent GRARR tracking was accomplished via standard GRARR ranging side tones. USB tracking consisted only of coherent-carrier Doppler tracking. The S-band transponder was a single-channel transponder; therefore, simultaneous operation was not possible.

------- GEOS 3, STEPHANIDES---

INVESTIGATION NAME- LASER TRACKING REFLECTOR

NSSDC ID- 75-027A-04

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION
GEODESY

PERSONNEL
PI - C.C. STEPHANIDES NASA-GSFC

BRIEF DESCRIPTION

Laser corner reflectors, composed of 264 35-mm cubes, and ground-based laser systems were used to obtain precise satellite tracking information. The Applied Physics Laboratory provided the laser cube reflector panels. The cubes were configured on the lateral surface of a conic frustum, with the lateral surface of the frustum adjoining the bottom, earth-oriented surface of the spacecraft at a 45-deg angle. The base of the frustum measured approximately 0.9 meter in diameter. When illuminated by a laser light pulse from the ground, each retroreflector cube in the array reflected the light ray back to a special telescope receiver on the ground. The reflected light was picked up by the telescope, and the optical impulses converted to an electrical signal. A digital counter recorded the time when the light beam was returned to the ground. The total travel time of the light pulses, from ground to satellite and back to the ground, measured the distance to the satellite, thus forming the basis of the satellite optical laser system. The following observational systems acquired the necessary data: NASA/Wallops Laser Ranging Systems, SAO (Smithsonian Astrophysical Observatory) Laser Ranging Systems, GSFC Laser Ranging Systems, and other national and international laser stations as determined.

***************************** GMS *****************************

SPACECRAFT COMMON NAME- GMS
ALTERNATE NAMES- GEOSTATION.METEOROL.SAT., HIMAWARI

NSSDC ID- 77-065A

LAUNCH DATE- 07/14/77 WEIGHT 647. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

JAPAN	NASDA
UNITED STATES	NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 07/17/77
ORBIT PERIOD- 1429.4 MIN	INCLINATION- 1.2 DEG
PERIAPSIS- 35531. KM ALT	APOAPSIS- 35779. KM ALT

PERSONNEL

PM - N.	KODAIRA	METEOROL SATELLITE CTR
PS -	JMA STAFF	JAPANESE METEOROL AGCY

BRIEF DESCRIPTION

The Geostationary Meteorological Satellite (GMS) was Japan's contribution to the international GARP (Global Atmospheric Research Program). One major objective of GARP was to obtain synoptic global meteorological data sets for 1 year's duration (to include two optimized observing periods of a few weeks each). These data served as raw material to optimize computer models for meteorological prediction. It was hoped that determination could be made of the time limitation for short-term modeling. This spacecraft was roughly cylindrical with a height of 345 cm and a diameter of 216 cm. The cylindrical surface was covered with solar cells which could provide 225 W. The satellite was spin-stabilized with a despun earth-pointing antenna. The satellite was positioned near 140 deg E and designed to operate for 5 years.

------- GMS, JMA STAFF---

INVESTIGATION NAME- VISIBLE AND INFRARED SPIN-SCAN RADIOMETER (VISSR)

NSSDC ID- 77-065A-01

INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION

The Visible and IR Spin-Scan Radiometer (VISSR) was similar to VISSR experiments on other GARP (Global Atmospheric Research Program) satellites such as GOES 1. The objectives were to make observations of the earth cloud cover location, land surface temperature, sea surface temperature, and cloud top temperature. It made both night IR (10.5 to 12.5 micrometers) and day IR, plus visible (0.5 to 0.75 micrometer) photometric observations of the subsatellite area at 30-min intervals. The visible channel had a resolution of about 1.25 km and the IR channel had a resolution of about 5 km at nadir.

Real-time transmission was available to the data acquisition station in Japan, with additional data transmission to other meteorological users as needed.

------- GMS, JMA STAFF--

INVESTIGATION NAME- WEATHER COMMUNICATIONS FACILITY

NSSDC ID- 77-065A-03 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION
The GMS included a communications facility. The objectives of this equipment were (1) to collect and relay weather observations from remote stations, including buoys, ships, and aircraft, and (2) to transmit weather information and analyses from the central weather facility to other weather stations.

------- GMS, KOHNO--

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR (SEM)

NSSDC ID- 77-065A-02 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - T. KOHNO INST PHYS + CHEM RES

BRIEF DESCRIPTION
The Space Environment Monitor (SEM) experiment observed the in situ charged particle environment. Solar protons (1 to 500 MeV), alpha particles (8 to 390 MeV) and solar electrons (greater than 2 MeV) were discriminated, and their respective energies monitored by means of a number of solid-state detectors.

*************************** GMS 2***************************

SPACECRAFT COMMON NAME- GMS 2
ALTERNATE NAMES- GEOSTATION.METEORO.SAT.2, HIMAWARI 2

NSSDC ID- 81-076A

LAUNCH DATE- 08/10/81 WEIGHT- 653. KG
LAUNCH SITE- TANEGASHIMA, JAPAN
LAUNCH VEHICLE- N-2

SPONSORING COUNTRY/AGENCY
JAPAN NASDA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 08/26/81
ORBIT PERIOD- 1435.9 MIN INCLINATION- 0.2 DEG
PERIAPSIS- 35776. KM ALT APOAPSIS- 35792. KM ALT

PERSONNEL
PM - N. KODAIRA METEOROL SATELLITE CTR
PS - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION
The Geostationary Meteorological Satellites (GMS) were Japan's contribution to the International Global Atmospheric Research Program (GARP). The spacecraft was roughly cylindrical with a height of 345 cm and a diameter of 216 cm. The cylindrical surface was covered with solar cells which provided 225 W. The satellite was spin-stabilized with a despun earth-pointing antenna. The satellite was positioned near 140 deg E and was designed to operate for 5 years. This was a follow-on GMS type spacecraft launched and controlled by NASDA of Japan.

------- GMS 2, JMA STAFF--

INVESTIGATION NAME- VISIBLE AND INFRARED SPIN-SCAN
RADIOMETER (VISSR)

NSSDC ID- 81-076A-01 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION
The Visible and Infrared Spin-Scan Radiometer (VISSR) was similar to VISSR experiments on other G''P (Global Atmospheric Research Program) satellites such as GOES 1 and GMS. The objectives were to make observations of the earth cloud cover location, land surface temperature, sea surface temperature, and cloud top temperature. It made both night IR (10.5 to 12.5 micrometers) and day IR measurements, plus visible (0.5 to 0.75 micrometer) photometric observations of the subsatellite area at 30-min intervals. The visible channel had a resolution of about 1.25 km, and the IR channel had a resolution of about 5 km at nadir. Real-time transmission was available to the data acquisition station in Japan, with additional data transmission to other meteorological users as needed. Because of optical failure since 1983, the experiment was subsequently replaced by its successor on GMS 3.

------- GMS 2, JMA STAFF--

INVESTIGATION NAME- WEATHER COMMUNICATIONS FACILITY

NSSDC ID- 81-076A-03 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION
The GMS 2 included a communications facility. The objectives of this equipment were (1) to collect and relay weather observations from remote stations, including buoys, ships, and aircraft, and (2) to transmit weather information and analyses from the central weather facility to other weather stations.

------- GMS 2, KOHNO--

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR (SEM)

NSSDC ID- 81-076A-02 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - T. KOHNO INST PHYS + CHEM RES

BRIEF DESCRIPTION
The Space Environment Monitor (SEM) experiment observed the in situ charged particle environment. Solar protons (1 to 500 MeV), alpha particles (8 to 390 MeV), and solar electrons (greater than 2 MeV) were discriminated, and their respective energies were monitored by means of a number of solid-state detectors.

*************************** GMS 3***************************

SPACECRAFT COMMON NAME- GMS 3
ALTERNATE NAMES- HIMAWARI 3, 15152

NSSDC ID- 84-080A

LAUNCH DATE- 08/02/84 WEIGHT- 681. KG
LAUNCH SITE- TANEGASHIMA, JAPAN
LAUNCH VEHICLE- N-2

SPONSORING COUNTRY/AGENCY
JAPAN NASDA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 09/17/84
ORBIT PERIOD- 1450.2 MIN INCLINATION- 1.86 DEG
PERIAPSIS- 35783. KM ALT APOAPSIS- 36340. KM ALT

PERSONNEL
PM - Y. ICHIKAWA NASDA
PS - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION
The Geostationary Meteorological Satellites (GMS) were Japan's contribution to the International Global Atmospheric Research Program (GARP). The spacecraft was roughly cylindrical with a height of 345 cm and a diameter of 215 cm. The cylindrical surface was covered with solar cells which provide 263 W. The satellite was spin-stabilized with a despun earth-pointing antenna. The satellite was positioned near 140 deg E and was designed to operate for 5 years. This was a follow-on GMS type spacecraft launched and controlled by NASDA of Japan.

------- GMS 3, JMA STAFF--

INVESTIGATION NAME- VISIBLE AND INFRARED SPIN-SPAN
RADIOMETER (VISSR)

NSSDC ID- 84-080A-01 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

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PERSONNEL
PI - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION
The Visible and Infrared Spin-Scan Radiometer (VISSR) was similar to VISSR experiments on other GARP (Global Atmospheric Research Program) satellites such as GOES 1 and GMS. The objectives were to make observations of the earth cloud cover location, land surface temperature, sea surface temperature, and cloud top temperature. It made both night IR (10.5 to 12.5 micrometers) and day IR measurements, plus visible (0.5 to 0.75 micrometer) photometric observations of the subsatellite area at 30-min intervals. The visible channel had a resolution of about 1.25 km, and the IR channel had a resolution of about 5 km at nadir. Real-time transmission was available to the data acquisition station in Japan, with additional data transmission to other meteorological users as needed.

------- GMS 3, JMA STAFF---

INVESTIGATION NAME- WEATHER COMMUNICATIONS FACILITY

NSSDC ID- 84-080A-03 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION
The GMS 3 included a communications facility. The objectives of this equipment were (1) to collect and relay weather observations from remote stations, including buoys, ships, and unmanned stations, and (2) to transmit weather information and analyses from the central weather facility to other weather stations.

------- GMS 3, KOHNO---

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR (SEM)

NSSDC ID- 84-080A-02 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - T. KOHNO INST PHYS + CHEM RES

BRIEF DESCRIPTION
The Space Environment Monitor (SEM) experiment observed the in situ charged-particle environment. Solar protons (0.8 to 100 MeV), alpha particles (8 to 370 MeV), and solar electrons (>=2 MeV) were discriminated, and their respective energies were monitored by means of a number of solid-state detectors.

************************** GOES 1 **************************

SPACECRAFT COMMON NAME- GOES 1
ALTERNATE NAMES- SMS-C, GOES-A

NSSDC ID- 75-100A

LAUNCH DATE- 10/16/75 WEIGHT- 631. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 10/17/75
ORBIT PERIOD- 1412.0 MIN INCLINATION- 1.0 DEG
PERIAPSIS- 34165. KM ALT APOAPSIS- 36458. KM ALT

PERSONNEL
PM - G.W. LONGANECKER NASA-GSFC
PS - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION
GOES 1 (SMS-C) was a NASA-developed, NOAA-operated, geosynchronous, and operational spacecraft. The spin-stabilized spacecraft carried (1) a visible infrared spin-scan radiometer (VISSR) to provide high-quality day and night cloudcover data and to take radiance-derived temperatures of the earth/atmosphere system, (2) a meteorological data collection and transmission system to relay processed data from central weather facilities to APT-equipped regional stations and to collect and retransmit data from remotely located earth-based platforms, and (3) a space environment monitor (SEM) system to measure proton, electron, and solar X-ray fluxes and magnetic fields. The cylindrically shaped spacecraft measured 190.5 cm in diameter and 230 cm in length, exclusive of a magnetometer that extended an additional 83 cm beyond the cylinder shell. The primary structural members were a honeycombed equipment shelf and thrust tube. The VISSR telescope was mounted on the equipment shelf and viewed the earth through a special aperture in the side of the spacecraft. A support structure extended radially from the thrust tube and was affixed to the solar panels, which formed the outer walls of the spacecraft and provided the primary source of electrical power. Located in the annulus-shaped space between the thrust tube and the solar panels were stationkeeping and dynamics control equipment, batteries, and most of the SEM equipment. Proper spacecraft attitude and spin rate (approximately 100 rpm) were maintained by two separate sets of jet thrusters mounted around the spacecraft equator and activated by ground command. The spacecraft used both UHF-band and S-band frequencies in its telemetry and command subsystem. A low-power VHF transponder provided telemetry and command during launch and then served as a backup for the primary subsystem once the spacecraft had attained synchronous orbit. For more detailed information, see "The GOES/SMS User's Guide" (TRF B28599), available from NSSDC. On December 1, 1978, responsibility for GOES 1 was turned over to ESA to be used as part of GARP. It was stationed over the Indian Ocean and controlled by ESOC in Darmstadt, F.R.G. In December 1979, it was returned to the control of NOAA and positioned at 135 deg W. When GOES 5 VAS experienced a failure on July 30, 1984, GOES 6 was moved east and GOES 1 was reactivated by NOAA to provide visible imaging capability over the western United States. GOES 1 failed on February 3, 1985.

------- GOES 1, LEINBACH---

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- 75-100A-02 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION
A number of separate silicon solid-state detectors, each having a tailored moderator thickness and a separate electronics unit for pulse amplification and pulse-height discrimination, were used to obtain particle-type/energy measurements. Seven channels measured protons in the range 1 to 500 MeV. Six channels measured alpha particles in the range 4 to 400 MeV. One channel measured electrons greater than 2.8 MeV.

------- GOES 1, LEINBACH---

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- 75-100A-03 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION
The X-ray counter was composed of a collimator, two ionization chambers, and two electrometers. A small angular aperture was chosen for the telescope collimator, which was mounted so that the declination of its axis could be controlled by ground command to ensure that the full disk of the sun was viewed by the telescope once during every vehicle rotation. One ion chamber was filled with argon at 1 atm for detection of 1- to 8-A X rays and had a 0.127-mm beryllium window to exclude X rays of longer wavelengths. The other chamber was filled with xenon at 1.5 to 2 atm and had a 1.27-mm beryllium window for measurements of X rays in the wavelength range 0.5 to 3 A.

------- GOES 1, LEINBACH---

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 75-100A-04 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL
OI - J.C. JOSELYN NOAA-ERL

BRIEF DESCRIPTION
A biaxial, closed-loop, fluxgate magnetometer was deployed on a boom about 0.61 m long. The magnetometer, which had one sensor aligned parallel to the spacecraft spin axis and the other perpendicular to this axis, measured the magnetic field at synchronous altitude. Each sensor had a selectable range (+50, 100, 200, or 400 nT), an offset field capability (plus or minus 1200 nT in 40-nT steps), and an inflight calibration capability.

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------- GOES 1, NESDIS STAFF-----------------------------------

INVESTIGATION NAME- VISIBLE INFRARED SPIN-SCAN RADIOMETER (VISSR)

NSSDC ID- 75-100A-01　　INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF　　NOAA-NESDIS
OI - W.E. SHENK　　NASA-GSFC

BRIEF DESCRIPTION
The Visible Infrared Spin-Scan Radiometer (VISSR) flown on GOES 1 provided day/night observations of cloud cover and earth/cloud radiance derived temperature measurements from a synchronous, spin-stabilized, geostationary satellite for use in operational weather analysis and forecasting. The two-channel instrument was able to take both full and partial pictures of the earth's disk. The infrared channel (10.5 to 12.6 micrometers) and the visible channel (0.55 to 0.70 micrometer) used a common optics system. Incoming radiation was received by an elliptically shaped scan mirror and collected by a Ritchey-Chretien optical system. The scan mirror was set at a nominal angle of 45 deg to the VISSR optical axis, which was aligned parallel to the spin axis of the spacecraft. The spinning motion of the spacecraft (approximately 100 rpm) provided a west-to-east scan motion when the spin axis of the spacecraft was oriented parallel with the earth's axis. The latitudinal scan was accomplished by sequentially tilting the scanning mirror north to south at the completion of each spin. A full picture took 18.2 min to complete and about 2 min to retrace. During each scan, the field of view on the earth was swept by a linear array of eight visible-spectrum detectors, each with a ground resolution of 0.9 km at zero nadir angle. A mercury-cadmium-telluride detector sensed the infrared portion of the spectrum with a horizontal resolution of approximately 8 km at zero nadir angle. The infrared portion of the detector measured radiance temperatures between 180 and 315 deg K, with a proposed sensitivity between 0.4 and 1.4 deg K. The VISSR output was digitized and transmitted to the National Oceanographic and Atmospheric Administration (NOAA) Command Data Acquisition Station, Wallops Island, Va. There the signal was fed into a "line stretcher" where it was stored and time-stretched for transmission back to the satellite at reduced bandwidth for re-broadcast to data utilization stations. The VISSR data, as with all operational type data, were handled by NOAA, and the majority of data was archived by National Climatic Center, Satellite Data Service Division, NOAA, Washington, D.C. The NSSDC has a limited amount of research-oriented date.

------- GOES 1, NESDIS STAFF-----------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 75-100A-05　　INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF　　NOAA-NESDIS

BRIEF DESCRIPTION
The meteorological data collection and transmission system was an experimental communications and data-handling system designed to receive and process meteorological data collected from remotely located, earth-based data collection (observation) platforms (DCP). The collected data were retransmitted from the satellite to ground-based, regional data utilization centers. Data from up to 10,000 DCP stations were handled by the system. The system also allowed for the retransmission of narrow-band (WEFAX-type) data from centralized weather facilities to small, ground-based APT receiver stations. This communications system operated on S-band frequencies. The minimum data collection system for one small meteorological satellite consisted of approximately 3500 DCP stations for contact in a 6-h period. The total amount of data collected during the 6-h period was between 350 and 600 kilobits, depending on the coding techniques. Data received from individual stations varied from 50 to 3000 bits, depending on the types and varieties of sensors used at an individual DCP station.

**************************** GOES 2 ****************************

SPACECRAFT COMMON NAME- GOES 2
ALTERNATE NAMES- GOES-B

NSSDC ID- 77-048A

LAUNCH DATE- 06/16/77　　WEIGHT- 294. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES　　NOAA-NESS
UNITED STATES　　NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC　　EPOCH DATE- 06/21/77
ORBIT PERIOD- 1436. MIN　　INCLINATION- 0.88 DEG
PERIAPSIS- 35266. KM ALT　　APOAPSIS- 36304. KM ALT

PERSONNEL
PM - G.W. LONGANECKER　　NASA-GSFC
PS - W.E. SHENK　　NASA-GSFC

BRIEF DESCRIPTION
GOES 2 was a NASA-developed, NOAA-operated, geosynchronous, and operational spacecraft. The spin-stabilized spacecraft carried (1) a visible infrared spin-scan radiometer (VISSR) to provide high-quality day/night cloudcover data and to take radiance-derived temperatures of the earth/atmosphere system, (2) a meteorological data collection and transmission system to relay processed data from central weather facilities to APT-equipped regional stations and to collect and retransmit data from remotely located earth-based platforms, and (3) a space environment monitor (SEM) system to measure proton, electron, and solar X-ray fluxes and magnetic fields. The cylindrically shaped spacecraft measured 190.5 cm in diameter and 230 cm in length, exclusive of a magnetometer that extended an additional 83 cm beyond the cylinder shell. The primary structural members were a honeycombed equipment shelf and thrust tube. The VISSR telescope was mounted on the equipment shelf and viewed the earth through a special aperture in the side of the spacecraft. A support structure extended radially out from the thrust tube and was affixed to the solar panels, which formed the outer walls of the spacecraft and provided the primary source of electrical power. Located in the annulus-shaped space between the thrust tube and the solar panels were stationkeeping and dynamics control equipment, batteries, and most of the SEM equipment. Proper spacecraft attitude and spin rate (approximately 100 rpm) were maintained by two separate sets of jet thrusters mounted around the spacecraft equator and activated by ground command. The spacecraft used both UHF-band and S-band frequencies in its telemetry and command subsystem. A low-power VHF transponder provided telemetry and command during launch and then served as a backup for the primary subsystem once the spacecraft attained synchronous orbit. For more detailed information, see "The GOES/SMS User's Guide" (TRF B28599), available from NSSDC.

------- GOES 2, LEINBACH-----------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- 77-048A-02　　INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH　　NOAA-ERL
PI - H.H. SAUER　　NOAA-ERL

BRIEF DESCRIPTION
A number of separate silicon solid-state detectors, each with a tailored moderator thickness and a separate electronics unit for pulse amplification and pulse-height discrimination, were used to obtain the following particle type and energy measurements: seven channels measuring protons in the range 1 to 500 MeV, six channels measuring alpha particles in the range 4 to 400 MeV, and one channel measuring electrons > 2.8 MeV.

------- GOES 2, LEINBACH-----------------------------------

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- 77-048A-03　　INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH　　NOAA-ERL
PI - H.H. SAUER　　NOAA-ERL

BRIEF DESCRIPTION
The X-ray counter was composed of a collimator, two ionization chambers, and two electrometers. A small angular aperture was chosen for the telescope collimator, which was mounted so that the declination of its axis could be controlled by ground command to ensure that the full disk of the sun was viewed by the telescope once during every vehicle rotation. One ion chamber was filled with argon at 1 atm for detection of 1- to 8-A X rays and had a 0.127-mm beryllium window to exclude X rays of longer wavelengths. The other chamber was filled with xenon at 1.5 to 2 atm, and had a 1.27-mm beryllium window for measurement of X rays in the wavelength range 0.5 to 3 A.

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------- GOES 2, LEINBACH---

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 77-048A-04 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL
OI - J.C. JOSELYN NOAA-ERL

BRIEF DESCRIPTION
The magnetometer was a biaxial, closed-loop, fluxgate magnetometer with the two sensors aligned at right angles to one another. After mounting on a short boom (about .61 m), one sensor was aligned parallel to the spacecraft spin axis and the other perpendicular to this axis. Each sensor had a selectable range (50, 100, 200, or 400 nT), an offset field capability (plus or minus 1200 nT in 40-nT steps), and an inflight calibration capability.

------- GOES 2, NESDIS STAFF-------------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 77-048A-05 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
COMMUNICATIONS

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION
The meteorological data collection and transmission system was an experimental communications and data handling system designed to receive and process meteorological data collected from remotely located earth-based, data collection (observation) platforms (DCP). The collected data were retransmitted from the satellite to ground-based, regional data utilization centers. Data from up to 10,000 DCP stations could be handled by the system. The system also allowed for the retransmission of narrow-band (WEFAX-type) data from centralized weather facilities to existing small, ground-based APT receiving stations. This communications system operated on S-band frequencies. The minimum data collection system for one small meteorological satellite consisted of approximately 3500 DCP stations to be contacted in a 6-h period. The total amount of data collected during the 6-h period was between 350 and 600 kilobits, depending on the coding techniques. Data received from individual stations varied from 50 to 3000 bits, depending on the type and variety of sensors used at an individual DCP station.

************************** GOES 3 **************************

SPACECRAFT COMMON NAME- GOES 3
ALTERNATE NAMES- 10952, GOES-C

NSSDC ID- 78-062A

LAUNCH DATE- 06/16/78 WEIGHT- 294. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 06/17/78
ORBIT PERIOD- 1450.8 MIN INCLINATION- 1.7 DEG
PERIAPSIS- 35469.1 KM ALT APOAPSIS- 36679.2 KM ALT

PERSONNEL
PM - G.W. LONGANECKER NASA-GSFC
PS - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION
GOES 3 was a NASA-developed, NOAA-operated, geosynchronous, and operational spacecraft. The spin-stabilized spacecraft carried (1) a visible infrared spin-scan radiometer (VISSR) to provide high-quality day/night cloudcover data and to take radiance-derived temperatures of the earth/atmosphere system, (2) a meteorological data collection and transmission system to relay processed data from central weather facilities to APT-equipped regional stations and to collect and retransmit data from remotely located earth-based platforms, and (3) a space environment monitor (SEM) system to measure proton, electron, and X-ray fluxes and magnetic fields. The cylindrically shaped spacecraft measured 190.5 cm in diameter and 230 cm in length, exclusive of a magnetometer that extended an additional 83 cm beyond the cylinder shell. The primary structural members were a honeycombed equipment shelf and thrust tube. The VISSR telescope was mounted on the equipment shelf and viewed the earth through a special aperture in the side of the spacecraft. A support structure extended radially out from the thrust tube and was affixed to the solar panels, which formed the outer walls of the spacecraft and provided the primary source of electrical power. Located in the annulus-shaped space between the thrust tube and the solar panels were stationkeeping and dynamics control equipment, batteries, and most of the SEM equipment. Proper spacecraft attitude and spin rate (approximately 100 rpm) were maintained by two separate sets of jet thrusters mounted around the spacecraft equator and activated by ground command. The spacecraft used both UHF-band and S-band frequencies in its telemetry and command subsystem. A low-power VHF transponder provided telemetry and command during launch and then served as a backup for the primary subsystem once the spacecraft attained orbit. For more detailed information, see "The GOES/SMS User's Guide" (TRF B28599), available from NSSDC.

------- GOES 3, LEINBACH---

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- 78-062A-02 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION
A number of separate silicon solid-state detectors, each with a tailored moderator thickness and a separate electronics unit for pulse amplification and pulse-height discrimination, were used to obtain the following particle type and energy measurements: seven channels measuring protons in the range 1 to 500 MeV, six channels measuring alpha particles in the range 4 to 400 MeV, and one channel measuring electrons greater than 2.8 MeV.

------- GOES 3, LEINBACH---

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- 78-062A-03 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION
The X-ray counter was composed of a collimator, two ionization chambers, and two electrometers. A small angular aperture was chosen for the telescope collimator, which was mounted so that the declination of its axis could be controlled by ground command to ensure that the sun was viewed by the telescope once during every vehicle rotation. One ion chamber was filled with argon at 1 atm for detection of 1- to 8-A X rays and had a 0.127-mm beryllium window to exclude X rays of longer wavelengths. The other chamber was filled with xenon at 1.5 to 2 atm, and had a 1.27-mm beryllium window for measurements of X rays in the wavelength range 0.5 to 3 A.

------- GOES 3, LEINBACH---

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 78-062A-04 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL
OI - J.C. JOSELYN NOAA-ERL

BRIEF DESCRIPTION
The magnetometer was a biaxial, closed-loop, fluxgate magnetometer with the two sensors aligned at right angles to one another. After mounting on a short boom (about .61 m), one sensor was aligned parallel to the spacecraft spin axis and the other perpendicular to this axis. Each sensor had a selectable range (50, 100, 200, or 400 nT), an offset field capability (plus or minus 1200 nT in 40-nT steps), and an inflight calibration capability.

------- GOES 3, NESDIS STAFF-------------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 78-062A-05 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
COMMUNICATIONS

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION
The data collection system was an experimental communications and data-handling system designed to receive and process meteorological data collected from remotely located, earth-based, data collection (observation) platforms (DCP). The collected data were retransmitted from the satellite to small, ground-based, regional data utilization centers. Data from up to 10,000 DCP stations could be handled by the system. The system also allowed for the retransmission of narrow-band (WEFAX-type) data from centralized weather facilities to existing ground-based APT receiving stations. This communications system operated on S-band frequencies. The minimum data collection system for one small meteorological satellite consisted of approximately 3500 DCP stations to be contacted in a 6-h period. The total amount of data collected during the 6-h period was between 350 and 600 kilobits, depending on the coding techniques. Data received from individual stations varied from 50 to 3000 bits, depending on the type and variety of sensors used at an individual DCP station.

************************** GOES 4 **************************

SPACECRAFT COMMON NAME- GOES 4
ALTERNATE NAMES- GOES-D, 11964

NSSDC ID- 80-074A

LAUNCH DATE- 09/09/80 WEIGHT- 660. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 09/28/80
ORBIT PERIOD- 1436.2 MIN INCLINATION- 0.2 DEG
PERIAPSIS- 35776. KM ALT APOAPSIS- 35800. KM ALT

PERSONNEL
MG - A.J. CERVENKA NASA HEADQUARTERS
PM - G.W. LONGANECKER NASA-GSFC
PS - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION
GOES 4 was the sixth in a series of NASA-developed, NOAA-operated, geosynchronous and operational spacecraft. The spin-stabilized spacecraft carried (1) a VISSR (visible infrared spin scan radiometer) atmospheric sounder (VAS) to provide high-quality day/night cloudcover data, to take radiance-derived temperatures of the earth/atmosphere system, and to determine atmospheric temperature and water vapor content at various levels, (2) a meteorological data collection and transmission system to relay processed data from central weather facilities to APT-equipped regional stations and to collect and retransmit data from remotely located earth-based platforms, and (3) a space environment monitor (SEM) system to measure proton, electron, and solar X-ray fluxes and magnetic fields. The cylindrically shaped spacecraft measured 190.5 cm in diameter and 230 cm in length, exclusive of a magnetometer that extended an additional 83 cm beyond the cylindrical shell. The primary structural members were a honeycombed equipment shelf and thrust tube. The VISSR telescope was mounted on the equipment shelf and viewed the earth through a special aperture in the side of the spacecraft. A support structure extended radially from the thrust tube and was affixed to the solar panels, which formed the outer walls of the spacecraft to provide the primary source of electrical power. Located in the annulus-shaped space between the thrust tube and the solar panels were stationkeeping and dynamics control equipment, batteries, and most of the SEM equipment. Proper spacecraft attitude and spin rate (approximately 100 rpm) were maintained by two separate sets of jet thrusters mounted around the spacecraft equator and activated by ground command. The spacecraft used both UHF-band and S-band frequencies in its telemetry and command subsystem. A low-power VHF transponder provided telemetry and command during launch and then served as a backup for the primary subsystem once the spacecraft had attained synchronous orbit. When GOES 5 VAS experienced a failure on July 30, 1984, GOES 4 was reactivated by NOAA to provide GOES 1 VISSR data relay services to western users.

------- GOES 4, LEINBACH --

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- 80-074A-02 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION
The energetic particle monitor consisted of three detector assemblies, each covering limited regions of the overall energy spectrum. The first two detector assemblies monitored protons in seven energy ranges between 0.8 and 500 MeV, and alpha particles in six energy ranges from 4 to >400 MeV. There was also one channel for the measurement of electrons in the energy range above 500 keV. The third detector, high energy proton and alpha detector (HEPAD), monitored protons in four energy ranges above 370 MeV and alpha particles in two energy ranges above 640 MeV/nucleon.

------- GOES 4, LEINBACH --

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- 80-074A-03 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION
The X-ray monitor consisted of ion chamber detectors. The wavelength ranges and minimum useful threshold sensitivity were 0.5 to 3 A, 1.0E-13 J per sq cm per s; and 1 to 8 A, 1.0E-12 J per sq cm per s; with a dynamic range of 1.0E4.

------- GOES 4, NESDIS STAFF --------------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 80-074A-05 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION
The meteorological data collection and transmission system was an experimental communications and data handling system designed to receive and process meteorological data collected from remotely located, earth-based, data collection (observation) platforms (DCP). The collected data were retransmitted from the satellite to ground-based, regional data utilization centers. Data from up to 10,000 DCP stations could be handled by the system. The system also allowed for the retransmission of narrow-band (WEFAX-type) data from centralized weather facilities to existing small, ground-based APT receiving stations. This communications system operated on S-band frequencies. The minimum data collection system for one small meteorological satellite consisted of approximately 3500 DCP stations to be contacted in a 6-h period. The total amount of data collected during the 6-h period was between 350 and 600 kilobits, depending on the coding techniques. Data received from individual stations varied from 50 to 3000 bits, depending on the type and variety of sensors used at an individual DCP station.

************************** GOES 5 **************************

SPACECRAFT COMMON NAME- GOES 5
ALTERNATE NAMES- GOES-E

NSSDC ID- 81-049A

LAUNCH DATE- 05/22/81 WEIGHT- 660. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 07/29/81
ORBIT PERIOD- 1434. MIN INCLINATION- 0.32 DEG
PERIAPSIS- 35715. KM ALT APOAPSIS- 35769. KM ALT

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PERSONNEL

MG - A.J. CERVENKA — NASA HEADQUARTERS
PM - G.W. LONGANECKER — NASA-GSFC
PS - W.E. SHENK — NASA-GSFC

BRIEF DESCRIPTION

GOES 5 was the seventh in a series of NASA-developed, NOAA-operated, geosynchronous, and operational spacecraft. The spin-stabilized spacecraft was stationed at 75 deg W, and carried (1) an infrared spin-scan radiometer (VISSR) atmospheric sounder (VAS) to provide high-quality day/night cloudcover data, to take radiance-derived temperatures of the earth/atmosphere system, and to determine atmospheric temperature and water vapor content at various levels, (2) a meteorological data collection and transmission system to relay processed data from central weather facilities to APT-equipped regional stations and to collect and retransmit data from remotely located earth-based platforms, and (3) a space environment monitor (SEM) system to measure proton, electron, and solar X-ray fluxes and magnetic fields. The cylindrically shaped spacecraft measured 190.5 cm in diameter and 230 cm in length, exclusive of a magnetometer that extended an additional 83 cm beyond the cylindrical shell. The primary structural members were a honeycombed equipment shelf and thrust tube. The VISSR telescope was mounted on the equipment shelf and viewed the earth through a special aperture in the side of the spacecraft. A support structure extended radially from the thrust tube and was affixed to the solar panels, which formed the outer walls of the spacecraft to provide the primary source of electrical power. Located in the annulus-shaped space between the thrust tube and the solar panels were stationkeeping and dynamics control equipment, batteries, and most of the SEM equipment. Proper spacecraft attitude and spin rate (approximately 100 rpm) were maintained by two separate sets of jet thrusters mounted around the spacecraft equator and activated by ground command. The spacecraft used both UHF-band and S-band frequencies in its telemetry and command subsystem. A low-power VHF transponder provided telemetry and command during launch and then served as a backup for the primary subsystem once the spacecraft had attained synchronous orbit. On July 30, 1984, GOES 5 VAS experienced a failure, thus NOAA was prompted to reactivate GOES 1 and 4, to relocate GOES 6 to a more central 98 deg W position, and to reactivate GOES 1 and GOES 4 for the acquisition and relay of VISSR information, respectively, from the western United States.

------- GOES 5, LEINBACH---

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- 81-049A-02 — INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL

PI - H. LEINBACH — NOAA-ERL
PI - H.H. SAUER — NOAA-ERL

BRIEF DESCRIPTION

The energetic particle monitor consisted of three detector assemblies, each covering limited regions of the overall energy spectrum. The first two detector assemblies monitored protons in seven energy ranges between 0.8 and 500 MeV and alpha particles in six energy ranges from 4 to >400 MeV. There was also one channel for the measurement of electrons in the energy range above 500 keV. The third detector, high energy proton and alpha detector (HEPAD), monitored protons in four energy ranges above 370 MeV and alpha particles in two energy ranges above 640 MeV/nucleon.

------- GOES 5, LEINBACH---

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- 81-049A-03 — INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - H. LEINBACH — NOAA-ERL
PI - H.H. SAUER — NOAA-ERL

BRIEF DESCRIPTION

The X-ray monitor consisted of ion chamber detectors. The wavelength ranges and minimum useful threshold sensitivity were 0.5 to 3 A, 1.0E-13 J per sq cm per s; and 1 to 8 A, 1.0E-12 J per sq cm per s; with a dynamic range of 1.0E4.

------- GOES 5, LEINBACH---

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 81-049A-04 — INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - H. LEINBACH — NOAA-ERL
PI - H.H. SAUER — NOAA-ERL
OI - J.C. JOSELYN — NOAA-ERL

BRIEF DESCRIPTION

The magnetometer had a range of plus or minus 400 nT (without saturation) and a resolution of 0.1 nT over a range of plus or minus 50 nT.

------- GOES 5, NESDIS STAFF---

INVESTIGATION NAME- VISIBLE INFRARED SPIN-SCAN RADIOMETER
ATMOSPHERIC SOUNDER (VAS)

NSSDC ID- 81-049A-01 — INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI - NESDIS STAFF — NOAA-NESDIS
OI - W.E. SHENK — NASA-GSFC

BRIEF DESCRIPTION

The Visible Infrared Spin-Scan Radiometer (VISSR) Atmospheric Sounder (VAS) operated in three distinct modes to provide parameter measurement flexibility, spectral band selection, geographic location, and variable sensitivity. The VISSR mode was the same as the VISSR system on board the other GOES spacecraft. Both the IR channel (10.5 to 12.5 micrometers) and visible channel (0.55 to 0.75 micrometers) used common optics. Incoming radiation was collected by a Ritchey-Chretien optical system. The spinning motion of the spacecraft (100 rpm) provided a west-to-east scan motion. Scan mirror tilt after each spin provided a north-to-south (N-to-S) scan motion. A full picture took 18.2 min to complete and 2 min to reset for the next image. Eight visible-spectrum detectors (0.9 km horizontal resolution) and one mercury-cadmium-telluride IR detector (6.9 horizontal resolution) swept the earth during each scan. In the dwell-sounding mode, up to 12 spectral filters in a wheel covering the range 678.7 per cm (14.74 micrometers) through 2535 per cm (3.94 micrometers) were positioned into the optical train while the scanner was dwelling on a single N-to-S scan line. The filter wheel could be programmed so that each spectral band filter could dwell on a single scan line for from 0 to 255 spacecraft spins. Either the 6.9-km or 13.8-km resolution detectors could be selected for the seven filter positions operating in the spectral region 701.6 per cm (14.25 micrometers) through 1487 per cm (6.725 micrometers). For the remaining five spectral bands the 13.8-km resolution detectors were used. Selectable frame size, position and scan direction were also programmable via ground command. For the VAS demonstration, 10-bit reduced resolution (3.5 km) visible data were provided for imaging. In some of the spectral regions, multiple-line data were required to enhance the signal-to-noise (S/N) ratio. Typically, 20-50 satellite spins at the same N-to-S scan line position were required to obtain the desired sounding data. This number of spins per line should be adequate to obtain soundings having a 30- x 30-km resolution. The multispectral imaging (MSI) mode could provide normal VISSR IR imaging plus data in any two selected spectral bands having a spatial resolution of 13.8 km. This mode of operation took advantage of the small mercury-cadmium-telluride detector offset in the N-to-S plane. Using the data from these detectors simultaneously produced a complete infrared map when they were operated every other scan line. This allowed using the larger detectors during half of the imaging/scanning sequence period to obtain additional spectral information. Unlimited N-to-S frame size and position selection, within the maximum N-to-S FOV scan direction, could be selected. The VISSR output was digitized and transmitted to the NOAA Command and Data Acquisition Station, Wallops Island, Va. There the signal was fed into a "line stretcher," where it was stored and time-stretched for transmission back to the satellite at reduced bandwidth for rebroadcast to APT user stations. The VISSR data were handled by NOAA and eventually sent to the Satellite Data Services Division, National Climatic Center, Washington, D.C., for archiving. Since Wallops Island is committed to NOAA operational support, data from the VAS MSI mode and the dwell sounding mode are not "stretched."

------- GOES 5, NESDIS STAFF---

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 81-049A-05 — INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
COMMUNICATIONS

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION
The meteorological data collection and transmission system was an experimental communications and data-handling system designed to receive and process meteorological data collected from remotely located, earth-based, data collection (observation) platforms (DCP). The collected data were retransmitted from the satellite to ground-based, regional data utilization centers. Data from up to 10,000 DCP stations could be handled by the system. The system also allowed for the retransmission of narrow-band (WEFAX-type) data from centralized weather facilities to existing small, ground-based APT receiving stations. This communications system operated on S-band frequencies. The minimum data collection system for one small meteorological satellite consisted of approximately 3500 DCP stations to be contacted in a 6-h period. The total amount of data collected during the 6-h period was between 350 and 600 kilobits, depending on the coding techniques. Data received from individual stations varied from 50 to 3000 bits, depending on the type and variety of sensors used at an individual DCP station.

************************** GOES 6 **************************

SPACECRAFT COMMON NAME- GOES 6
ALTERNATE NAMES- GOES-F, 14050

NSSDC ID- 83-041A

LAUNCH DATE- 04/28/83 WEIGHT- 660. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 06/29/83
ORBIT PERIOD- 1436.0 MIN INCLINATION- 0.27 DEG
PERIAPSIS- 35775.2 KM ALT APOAPSIS- 35796.2 KM ALT

PERSONNEL
MG - A.J. CERVENKA NASA HEADQUARTERS
PM - G.W. LONGANECKER NASA-GSFC
PS - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION
GOES 6 was the eighth in a series of NASA-developed, NOAA-operated, geosynchronous, and operational spacecraft. The spin-stabilized spacecraft carried (1) a visible infrared spin-scan radiometer (VISSR) atmospheric sounder (VAS) to provide high-quality day/night cloudcover data, to take radiance-derived temperatures of the earth/atmosphere system, and to determine atmospheric temperature and water vapor content at various levels, (2) a meteorological data collection system to relay processed data from central weather facilities to regional stations equipped with APT and to collect and retransmit data from remotely located earth-based platforms, and (3) a space environment monitor (SEM) system to measure proton, electron, and solar X-ray fluxes and magnetic fields. The cylindrically shaped spacecraft measured 190.5 cm in diameter and 230 cm in length, exclusive of a magnetometer that extended an additional 83 cm beyond the cylindrical shell. The primary structural members were a honeycombed equipment shelf and a thrust tube. The VISSR telescope, which was mounted on the equipment shelf, viewed the earth through a special aperture in the side of the spacecraft. A support structure extended radially from the thrust tube and was affixed to the solar panels, which formed the outer wall of the spacecraft to provide the primary source of electrical power. Located in the annulus-shaped space between the thrust tube and the solar panels were stationkeeping and dynamics control equipment, batteries, and most of the SEM equipment. Proper spacecraft attitude and spin rate (approximately 100 rpm) were maintained by two separate sets of jet thrusters mounted around the spacecraft equator and activated by ground command. The spacecraft used both UHF-band and S-band frequencies in its telemetry and command subsystem. A low-power VHF transponder provided telemetry and command during launch and then served as a backup for the primary subsystem once the spacecraft attained synchronous orbit. GOES 6 was moved from its 135 deg W position to a more central 98 deg W position when GOES 5 failed on July 29, 1984.

------- GOES 6, LEINBACH---

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- 83-041A-02 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION
The energetic particle monitor consisted of three detector assemblies, each covering limited regions of the overall energy spectrum. The first two detector assemblies monitored protons in seven energy ranges between 0.8 and 500 MeV, and alpha particles in six ranges from 4 to >400 MeV. There was also one channel for the measurement of electrons in the >=500 keV range. The third detector, the high energy proton and alpha detector (HEPAD), monitored protons in four energy ranges above 370 MeV and alpha particles in two energy ranges above 640 MeV/nucleon.

------- GOES 6, LEINBACH---

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- 83-041A-03 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION
The X-ray monitor consisted of ion chamber detectors. The ranges and minimum useful threshold sensitivities were 0.5 to 3 A, 1.0E-13 J per sq cm per s and 1 to 8 A, 1.0E-12 J per sq cm per s with a dynamic range of 1.0E4.

------- GOES 6, LEINBACH---

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 83-041A-04 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL
OI - J.N. BARFIELD SOUTHWEST RES INST

BRIEF DESCRIPTION
The magnetometer had a range of plus or minus 400 nT (without saturation) and a resolution of 0.1 nT over a range of plus or minus 50 nT.

------- GOES 6, NESDIS STAFF---------------------------------------

INVESTIGATION NAME- VISIBLE INFRARED SPIN-SCAN RADIOMETER
ATMOSPHERIC SOUNDER (VAS)

NSSDC ID- 83-041A-01 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS
OI - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION
The Visible Infrared Spin-Scan Radiometer (VISSR) Atmospheric Sounder (VAS) operated in three distinct modes to provide parameter measurement flexibility, spectral band selection, geographic location, and variable sensitivity. The VISSR mode was the same as the VISSR system on board GOES 1-3 except that the FOV for the VAS infrared imaging was 6.9 km. Both the IR channel (10.5 to 12.5 micrometers) and visible channel (0.55 to 0.75 micrometers) used common optics. Incoming radiation was collected by a Ritchey-Chretien optical system. One west-to-east raster line was formed for each revolution of the spacecraft. A 20-deg north-to-south (N-to-S) frame resulted from a total of 1821 steps of the scan mirror, one 0.192-mr step for each spacecraft revolution. A full picture took 18.2 min to complete and 2 min to reset for the next image. Eight visible-spectrum detectors (0.9 km horizontal resolution) and one mercury-cadmium-telluride IR detector (6.9 km horizontal resolution) swept the earth during each scan. In the dwell-sounding mode, up to 12 spectral filters in a wheel covering the range 678.7 per cm (14.74 micrometers) through 2535 per cm (3.94 micrometers) were positioned into the optical train while the scanner was dwelling on a single N-to-S scan line. The filter wheel was programmed so that each spectral band filter dwelled on a single scan line for from 0 to 255 spacecraft spins. Either the 6.9-km- or 13.8-km-resolution detectors could be selected for the seven filter positions operating in the spectral region 701.6 per cm (14.25 micrometers) through 1487 per cm (6.725 micrometers). For the remaining five spectral bands, the 13.8-km-resolution detectors were used. Selectable frame size, position and scan direction were also programmable via ground command. For the VAS demonstration, 10-bit reduced resolution

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OF POOR QUALITY

(3.5 km) visible data were provided for imaging. In some of the spectral regions, multiple-line data were required to enhance the signal-to-noise ratio. Typically, 20-50 satellite spins at the same N-to-S scan line position were required to obtain the desired sounding data. This number of spins per line could provide the soundings a 30- x 30-km resolution. The multispectral imaging (MSI) mode could provide either (1) four spectral channel observations (the visible at 0.9-km resolution, the 11-micrometer window at 6.9-km resolution, and any two selected spectral bands at 13.8-km resolution), or (2) five spectral channel observations (the visible at 0.9-km resolution and any four infrared spectral channels at 13.8-km resolution). This mode of operation took advantage of the small mercury-cadmium-telluride detector offset in the N-to-S plane. Using the data from these detectors simultaneously produced a complete infrared map when they were operated every other scan line. This allowed using the larger detectors during half of the imaging/scanning sequence period to obtain additional spectral information. Unlimited N-to-S frame size and position selection, within the maximum N-to-S FOV scan direction, could be selected. Visible data were not available in this mode. The VISSR output was digitized and transmitted to the NOAA Command and Data Acquisition Station, Wallops Island, Va. There the signal was fed into a "line stretcher," where it was stored and time-stretched. The stetched data were immediately transmitted back to the satellite at reduced bandwidth for rebroadcast to APT user stations and regional forecast centers. The VISSR data were handled by NOAA and eventually sent to the Satellite Data Services Division, National Climatic Center, Washington, D.C., for archiving.

------- GOES 6, NESDIS STAFF-----------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 83-041A-05 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION
The meteorological data collection system was an experimental communications and data handling system designed to receive and process meteorological data collected from remotely located earth-based data collection (observation) platforms (DCP). The collected data were retransmitted from the satellite to ground-based, regional data utilization centers. Data from up to 10,000 DCP stations could be handled by the system. The system also allowed for the retransmission of narrow-band (WEFAX-type) data from centralized weather facilities to small ground-based APT receiving stations. This communications system operated on S-band frequencies. The minimum data collection system for one small meteorological satellite consisted of approximately 3500 DCP stations to be contacted in a 6-h period. The total amount of data collected during the 6-h period was between 350 and 600 kilobits, depending on the coding techniques. Data received from individual stations varied from 50 to 3000 bits, depending on the type and variety of sensors used at an individual DCP station.

************************** HAKUCHO **************************

SPACECRAFT COMMON NAME- HAKUCHO
ALTERNATE NAMES- COSMIC RADIATION SAT B, CORSA-B
11272

NSSDC ID- 79-014A

LAUNCH DATE- 02/21/79 WEIGHT- 96. KG
LAUNCH SITE- KAGOSHIMA SPACE CENTER, JAPAN
LAUNCH VEHICLE- M-3C

SPONSORING COUNTRY/AGENCY
JAPAN ISAS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 02/22/79
ORBIT PERIOD- 93.1 MIN INCLINATION- 29.9 DEG
PERIAPSIS- 421. KM ALT APOAPSIS- 433. KM ALT

PERSONNEL
PM - M. ODA U OF TOKYO
PS - S. HAYAKAWA NAGOYA U

BRIEF DESCRIPTION
After launch, the sixth Japanese satellite, CORSA-B, was officially renamed Hakucho, the Japanese word for swan. The spacecraft had the shape of an octagonal rightprism, with maximum width 80 cm and height 65 cm, and was spin-stabilized at a rate of 5 to 8 rpm. The spin axis was maneuvered by means of magnetic torquing. Eleven X-ray detectors of various specifications were devoted to the observation of cosmic X rays. Four detectors had fields of view perpendicular to the spin axis and scanned over a wide region of the sky in search of X-ray novae and transients. The other seven detectors had FOVs along the spin axis and were used to study selected celestial objects. Observational data could either be telemetered back in real-time or stored in an onboard data-recorder. Telemetry frequencies were 136.725 MHz at 500 mW and 400.450 MHz at 100 mW. The scientific objectives of Hakucho were (1) a systematic survey and watch of short-lived X-ray phenomena, (2) observations of selected X-ray sources with a wide spectral coverage (0.1 to 100 keV), (3) study of short-term variabilities and pulsations of X-ray sources, and (4) study of the X-ray sky in the sub-keV range.

------- HAKUCHO, MAKINO-----------------------------------

INVESTIGATION NAME- DIFFUSE SOFT X-RAYS AND SOFT X-RAY SOURCES

NSSDC ID- 79-014A-02 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL
PI - F. MAKINO ISAS
PI - Y. TANAKA ISAS

BRIEF DESCRIPTION
This experiment surveyed the sky and monitored transient soft X-ray sources, in the energy range 0.1 to 2 keV, by means of gas-flow proportional counters with thin polypropylene windows.

------- HAKUCHO, MIYAMOTO-----------------------------------

INVESTIGATION NAME- MONITOR OF X-RAY SOURCES

NSSDC ID- 79-014A-01 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL
PI - S. MIYAMOTO OSAKA U
PI - Y. OGAWARA ISAS
PI - I. KONDO U OF TOKYO
PI - M. YOSHIMORI RIKKYO U
OI - H. INOUE ISAS
OI - K. KOYAMA ISAS
OI - K. MAKISHIMA ISAS
OI - M. MATSUOKA ISAS
OI - T. MURAKAMI ISAS
OI - T. OHASHI ISAS
OI - N. SHIBAZAKI ISAS
OI - Y. TANAKA ISAS
OI - H. KUNIEDA ISAS
OI - F. MAKINO ISAS
OI - K. MASAI NAGOYA U
OI - F. NAGASE NAGOYA U
OI - Y. TAWARA NAGOYA U
OI - H. TSUNEMI OSAKA U
OI - K. YAMASHITA OSAKA U

BRIEF DESCRIPTION
This experiment located and monitored X-ray burst sources and other variable X-ray sources, over the energy range 1 to 100 keV, using rotating modulation collimators and other collimators.

************************** HELIOS-A **************************

SPACECRAFT COMMON NAME- HELIOS-A
ALTERNATE NAMES- HELIO-A, PL-741A
HELIOS 1

NSSDC ID- 74-097A

LAUNCH DATE- 12/10/74 WEIGHT- 371.2 KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- TITAN

SPONSORING COUNTRY/AGENCY
FED REP OF GERMANY BMWF
UNITED STATES NASA-OSSA

ORBIT PARAMETERS
ORBIT TYPE- HELIOCENTRIC EPOCH DATE- 01/16/75
ORBIT PERIOD- 190.15 DAYS INCLINATION- 0.02 DEG
PERIAPSIS- 0.3095 AU RAD APOAPSIS- 0.985 AU RAD

PERSONNEL
MG - E.J. MONTOYA NASA HEADQUARTERS
SC - A.G. OPP NASA HEADQUARTERS
PM - A. KUTZER GES FUR WELTRAUMFORSCH
PM - G.W. OUSLEY NASA-GSFC
PS - H. PORSCHE DFVLR
PS - J.H. TRAINOR NASA-GSFC

BRIEF DESCRIPTION
This spacecraft was one of a pair of deep space probes developed by the Federal Republic of Germany (FRG) in a cooperative program with NASA. Experiments were provided by scientists from both FRG and the U.S. NASA supplied the Titan/Centaur launch vehicle. The spacecraft was equipped with two booms and a 32-m electric dipole. The payload consisted of a fluxgate magnetometer; electric and magnetic wave

experiments, which covered various bands in the frequency range 6 Hz to 3 MHz; charged-particle experiments, which covered various energy ranges starting with solar wind thermal energies and extending to 1 GeV; a zodiacal-light experiment; and a micrometeoroid experiment. The purpose of the mission was to make pioneering measurements of the interplanetary medium from the vicinity of the earth's orbit to 0.3 AU. The spin axis was normal to the ecliptic, and the nominal spin rate was 1 rps. The outer spacecraft surface was dielectric, effectively (because of the sheath potential) raising the low-energy threshold for the solar wind plasma experiment to as high as 100 eV. Also, sheath-related coupling caused by the spacecraft antennae produced interference with the wave experiments. The spacecraft was capable of being operated at bit rates from 4096 to 8 bps, variable by factors of 2. While the spacecraft was moving to perihelion, it was generally operated from 64 to 256 bps; and near 0.3 AU, it was operated at the highest bit rate. Because of a deployment failure of one axis of the 32-m, tip-to-tip, dipole antenna, one axis was shorted, causing the antenna to function as a monopole. The major effect of this anomaly was to increase the effective instrument thresholds, and to introduce additional uncertainties in the effective antenna length. Instrument descriptions written by the experimenters were published (some in German, some in English) in Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, FECHTIG--

INVESTIGATION NAME- MICROMETEOROID DETECTOR AND ANALYZER

NSSDC ID- 74-097A-12 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
INTERPLANETARY DUST

PERSONNEL

PI - H.	FECHTIG	MPI-NUCLEAR PHYS
OI - J.	WEIHRAUCH	MPI-PHYS ASTROPHYS

BRIEF DESCRIPTION

The purpose of the experiment (E10) was to investigate some theories about the interplanetary dust including whether or not (1) the number of particles increases toward the sun, (2) the cutoff for small particles is dependent on the distance from the sun, because solar pressure increases nearer the sun, and (3) the number densities of particles change near the orbits of planets. The kinetic energy of dust particles hitting a target with high velocity (several km/s) caused the material to vaporize and become partially ionized. The generated plasma cloud was then separated by appropriate voltages into its negative (electron) part and into positive ions. The mass and the energy of the dust particles were determined from the impulse heights. A time-of-flight mass spectrometer in connection with the target allowed the small ion cloud to be analyzed. In this way, the investigation of the chemical composition of the dust particles became possible. The threshold for the detection of a particle was about 1.E-15 g. Mass and energy determination was possible for particles larger than about 1.E-14 g. For particles larger than 1.E-13 g, a mass spectrum was gathered. For further details, see pp. 268-269 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, GURNETT--

INVESTIGATION NAME- SOLAR WIND PLASMA WAVE

NSSDC ID- 74-097A-04 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - D.A.	GURNETT	U OF IOWA
OI - P.J.	KELLOGG	U OF MINNESOTA
OI - S.J.	BAUER	GRAZ U
OI - R.G.	STONE	NASA-GSFC

BRIEF DESCRIPTION

This experiment (E5a) shared the 32-m, tip-to-tip electric antenna with experiments -05 and -06. The instrument consisted of a 16-channel spectrum analyzer with approximately logarithmically equispaced center frequencies, 16 log compressors, 16 RC integrators for averaging the log compressed electric field amplitude between readouts, and 16 peak detectors which were reset after readout. The 16 averages and 16 peak log values were sampled almost simultaneously. The channels covered the frequency range of about 20 Hz to 200 kHz, with four channels per decade of frequency. The log compressors had a dynamic range of 100 dB. Sampling rate depended in detail on the spacecraft bit rate and telemetry format. The fastest real-time telemetered rate was for 16 averages and 16 peak values to be sampled every 1.125 s. Whenever a very strong signal was detected in a pre-selected channel, the shock alarm data mode was initiated in which the electric field spectrum, magnetic field, and plasma data were recorded into spacecraft memory for a period starting before and terminating after the triggering signal time. The maximum sampling rate of the spectrum data in this mode was 14.2 samples per second for each channel. One half of the dipole antenna failed to extend properly and was short-circuited to the spacecraft ground. The resultant configuration was that of a monopole which was calculated to have an effective length of approximately 8 m. The primary detrimental effects were the loss of 6 dB in E-field sensitivity due to the shortened antenna and the increase in the 178 kHz channel by 25 dB. Solar cell and sheath effects caused interference in the lowest 6 channels (which was less severe with increasing channel frequency). For more details, see J. Geophys. Res., v. 82, p. 632, 1975, and pp. 245-247 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, GURNETT--

INVESTIGATION NAME- FINE FREQUENCY, COARSE TIME RESOLUTION SPECTRUM ANALYSIS

NSSDC ID- 74-097A-05 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - D.A.	GURNETT	U OF IOWA
OI - P.J.	KELLOGG	U OF MINNESOTA
OI - S.J.	BAUER	GRAZ U
OI - R.G.	STONE	NASA-GSFC

BRIEF DESCRIPTION

This experiment (E5b) shared the 32-m, tip-to-tip, electric dipole antenna with experiments -04 and -06. Instrumentation consisted of three tunable plasma wave receivers, a fixed-frequency wideband receiver, and a waveform sampler. The tunable receivers and wideband receiver provided data for direct telemetry to earth. Each of the tunable receivers covered a different frequency band in the range 1 Hz to 200 kHz. The high-frequency receiver had 96 frequency settings separated by about 4%, and covered the frequency range 6.4 kHz to 205 kHz. The mid-range receiver had 48 frequency settings separated by about 8%, and covered the range 208 Hz to 6.07 kHz. The low-frequency receiver had 24 settings with 15% separation, and covered the range 11 Hz to 309 Hz. The response time of the low-frequency receiver was approximately 1 s, necessitating the inclusion of the wideband receiver to obtain information about the angular distribution of waves appearing in the low-frequency band. This receiver covered the frequency range 1 Hz to 200 Hz. The time resolution depended in detail on the spacecraft telemetry format, bit rate, and experiment operational mode. When the shock alarm mode became activated, data from the waveform sampler were read into spacecraft memory for a period starting before and ending after the triggering event. In this mode, the instantaneous voltage across the antenna was passed through a low-pass filter with corner frequency dependent on the sampling rate, and measured at discrete intervals, the most rapid being 2.2 ms. One half of the electric dipole failed to deploy properly, and became short-circuited to the spacecraft ground. The resulting configuration was that of a monopole with an operational effective length of about 8 m. This resulted in a 6-dB loss in sensitivity, and an increased receiver noise level, particularly at low frequencies. In addition, the high-gain telemetry antenna produced additional interference. For a more detailed discussion, see p. 248 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, GURNETT--

INVESTIGATION NAME- 26.5-KHZ TO 3-MHZ RADIO WAVE

NSSDC ID- 74-097A-06 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
RADIO PHYSICS
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL

PI - D.A.	GURNETT	U OF IOWA
OI - P.J.	KELLOGG	U OF MINNESOTA
OI - R.R.	WEBER	NASA-GSFC
OI - R.G.	STONE	NASA-GSFC

BRIEF DESCRIPTION

This experiment (E5c) shared the 32-m, tip-to-tip, electric dipole antenna with experiments -04 and -05. A dual (redundant) 16-frequency channel radiometer, with approximately logarithmically spaced channels, was used to detect type III radio emissions associated with solar flare events in the frequency band 26.5 kHz to 3 MHz. The experiment sampling rate was synchronized such that each spacecraft revolution was divided into 32 sectors. The sequence and frequency of sampling depended on the instrument operational mode (one of four) and the spacecraft bit rate. The most rapid sampling possible for a single-frequency channel was once every 1/32 of a satellite spin period, or about .03 s. A typical sampling sequence was for one frequency channel to be sampled for 16 sectors (1/2 revolution), followed by the next. One half of the 32-m dipole failed to extend properly during deployment, and was short-circuited to the spacecraft ground. The resulting antenna configuration was that of a monopole with an operational effective length of about 8 m. This shorter configuration resulted in increased radio-frequency

interference (rfI) of from 3 to 30 dB above expected levels, and a loss of 6 dB in gain. Another problem was unexpected interference with the high-gain telemetry antenna. This added 60 dB rfI at 27.5 kHz, decreasing with increasing frequency, so that above 200 kHz it produced no detectable interference. For more details about the instrument and modes of operation, see p. 250 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, KEPPLER-------

INVESTIGATION NAME- ENERGETIC ELECTRON AND PROTON DETECTOR

NSSDC ID- 74-097A-10 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - E.	KEPPLER	MPI-AERONOMY
OI - B.	WILKEN	MPI-AERONOMY
OI - D.J.	WILLIAMS	APPLIED PHYSICS LAB

BRIEF DESCRIPTION

The objective of the experiment (E8) was to study the origin and the distribution mechanism of low-energy electrons and protons. The instrument, a magnetic spectrometer, consisted of six semiconductor detectors with the field of view in the plane of the ecliptic. Species separation was achieved by an inhomogeneous magnetic field oriented perpendicular to the particle path. Four electron and two proton detectors measured electrons from 20 to 1000 keV and protons from 80 to 1000 keV. The proton measurements were made with a two-detector telescope employing coincidence and anticoincidence logic. Both particle species were measured in 16 energy channels through pulse-height analysis. For further information see pp. 261-263 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, KUNOW-------

INVESTIGATION NAME- COSMIC-RAY PARTICLES

NSSDC ID- 74-097A-07 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL

PI - H.W.	KUNOW	U OF KIEL
OI - G.H.	WIBBERENZ	U OF KIEL
OI - G.	GREEN	U OF KIEL
OI - R.	MULLER-MELLIN	U OF KIEL
OI - H.	WITTE	MPI-AERONOMY
OI - H.	HEMPE	U OF KIEL

BRIEF DESCRIPTION

The objective of the experiment (E6) was to study high-energy, charged, cosmic-ray particles of solar, planetary, and galactic origin in interplanetary space. Protons and alpha particles with energies >1.3 MeV/nucleon, and electrons >0.3 MeV were measured within interplanetary space over the range from 0.3 to 1.0 AU. The instrument, a particle telescope with a 55-deg field of view, consisted of five semiconductor detectors, one sapphire Cerenkov counter, and one scintillation counter, all enclosed by an anticoincidence cylinder. The telescope was calibrated prior to launch using radioactive sources, particle accelerators, and ground-level muons. It measured protons and alpha particles in six channels (1.3-3.3, 3.3-13, 13-27, 27-37, 37-45, and >45 MeV/nucleon) and electrons in five energy channels (0.3-0.8, 0.8-2, 2-3, 3-4, and >4 MeV). For more detail see pp. 253-257 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, LEINERT-------

INVESTIGATION NAME- ZODIACAL LIGHT PHOTOMETER

NSSDC ID- 74-097A-11 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
ZODIACAL LIGHT

PERSONNEL

PI - C.	LEINERT	MPI-ASTRONOMIE
OI - E.	PITZ	MPI-ASTRONOMIE

BRIEF DESCRIPTION

This experiment (E9) consisted of three photometers looking at 15 deg, 30 deg, and 90 deg from the ecliptic. These photometers observed the intensity and polarization of the zodiacal light in UV, blue, and visual bands. The purpose of this experiment was to obtain information about the spatial distribution, size, and nature of interplanetary dust particles. For further details, see pp. 264-267 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, NESS-------

INVESTIGATION NAME- FLUXGATE MAGNETOMETER FOR AVERAGE FIELDS

NSSDC ID- 74-097A-02 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - N.F.	NESS	NASA-GSFC
OI - F.	MARIANI	U OF ROME
OI - L.F.	BURLAGA	NASA-GSFC
OI - S.C.	CANTARANO	CNR, SPACE PLASMA LAB

BRIEF DESCRIPTION

This experiment (E3) consisted of a boom-mounted, triaxial-fluxgate magnetometer. An automatic inflight range switch system selected the optimum of four ranges that were minus to plus 16, 48, 144, and 432 nT per sensor. These had corresponding digitization resolutions of minus to plus 0.03, 0.09, 0.28, and 0.84 nT, respectively. A sensor flipper was actuated every 36 h to assist in sensor zero level determination. For telemetry bit rates above 256 bps, vector measurements were made at rates between 1 and 16 per s, depending on bit rates. At lower bit rates, averages and variances were computed on board for transmission to earth.

------- HELIOS-A, NEUBAUER-------

INVESTIGATION NAME- FLUXGATE MAGNETOMETER FOR FIELD FLUCTUATIONS

NSSDC ID- 74-097A-01 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - F.M.	NEUBAUER	U OF COLOGNE
OI - A.	MAIER	BRAUNSCHWEIG TECH U

BRIEF DESCRIPTION

The instrument (E2) consisted of a triaxial fluxgate magnetometer mounted on a 2.75-m boom to make magnetic field measurements up to 4 Hz. Data from each axis were first sent through a low-pass filter with the 3-dB attenuation point at 4 Hz. Depending on the telemetry format and bit rate, the data were fed either into a time-averaging computer or directly connected to telemetry. A shock identification computer triggered the storage of rapid-rate data in the spacecraft memory when there were discontinuities in the variations of the ambient magnetic field. Two measurement ranges were used, plus or minus 100 and 400 nT with resolutions of plus or minus 0.2 and 0.8 nT, respectively. The instrument was equipped with a flipper mechanism, which reoriented each sensor by 90 deg periodically. For detailed information, see p. 232 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, ROSENBAUER-------

INVESTIGATION NAME- PLASMA DETECTORS

NSSDC ID- 74-097A-09 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - H.	PELLKOFER	MPI-EXTRATERR PHYS
OI - J.H.	WOLFE	NASA-ARC

BRIEF DESCRIPTION

This experiment (E1) employed three plasma analyzers for positive ions and one for electrons. All detectors were mounted normal to the spin axis. Positive ions with energy per charge within the range 0.155 to 15.32 keV/Q were measured in two angular dimensions using a combination of a hemispherical, a quadrispherical, and a sinusoidally shaped electrostatic analyzer. Electrons with energy from 0.5 to 1660 eV were measured with a hemispherical electrostatic analyzer in one dimension. The experiment operated in several modes, with differing time resolution depending in detail on telemetry format and spacecraft bit rate. Typical time resolution was on the order of a minute. Also, whenever the special shock alarm mode was triggered by experiments -04 or -01, high-time-resolution plasma data for a period before and after the event were recorded into spacecraft memory for later transmission. Because the spacecraft body was dielectric, sheath potentials of up to 100 eV degraded the usefulness of data taken in the lower electron-energy channels. This phenomenon was judged to have minimal effects on the usefulness of the ion data. For more detailed information see p. 226 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, TRAINOR---------------------------------------

INVESTIGATION NAME- GALACTIC AND SOLAR COSMIC RAYS

NSSDC ID- 74-097A-08   INVESTIGATIVE PROGRAM
                              CODE EL/CO-OP

                              INVESTIGATION DISCIPLINE(S)
                              COSMIC RAYS
                              PARTICLES AND FIELDS

PERSONNEL
PI - J.H. TRAINOR   NASA-GSFC
OI - E.C. ROELOF   APPLIED PHYSICS LAB
OI - B.J. TEEGARDEN   NASA-GSFC
OI - F.B. MCDONALD   NASA HEADQUARTERS
OI - K.G. MCCRACKEN   CSIRO

BRIEF DESCRIPTION
The detector complement of this experiment (E7) consisted of three separate dE/dx vs E telescopes and a proportional counter for monitoring solar X rays in the range 2-8 keV. The high-energy telescope had a geometric factor of 0.22 sq cm-sr and measured electrons in three ranges between 2 and 8 MeV, and protons and alpha particles in three ranges between 20 and 56 MeV/n. Protons above 230 MeV were also measured. The first low-energy telescope (geometric factor was 0.155 sq cm-sr) measured protons and Z>1 particles in three ranges between 3 and 21 MeV/n. The second low-energy telescope (geometric factor was 0.015 sq cm-sr) measured protons in several ranges between 0.12 and 2.1 MeV, alpha particles in the ranges 0.6-2.1 and 6-21.2 Me./n, and electrons in four ranges between 0.12 and 2 MeV. For a number of coincidence modes, counting-rate data sectored into eight 45-deg sectors were obtained. The data cycle time was dependent on the spacecraft telemetry rate (variable between 4096 and 8 bits/s) and format. Under optimum conditions, five events per second were pulse-height analyzed and the rate data cycle was of the order of 5 min. At the slowest combination of bit rate and format, a complete data cycle required about 2.5 h. See IEEE Trans. on Nuc. Sci., NS-22, p. 570, 1975, and Raumfahrtforschung, v. 19, n. 5, pp. 258-260, 1975, for further details.

**************************** HILAT ****************************

SPACECRAFT COMMON NAME- HILAT
ALTERNATE NAMES- STP P83-1, P83-1
                 14154

NSSDC ID- 83-063A

LAUNCH DATE- 06/27/83   WEIGHT- 246.3 KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- SCOUT

SPONSORING COUNTRY/AGENCY
UNITED STATES   DOD-USAF
CANADA   NRC

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC   EPOCH DATE-
ORBIT PERIOD- 101.5 MIN   INCLINATION- 82.2 DEG
PERIAPSIS- 828.2 KM ALT   APOAPSIS- 830.8 KM ALT

PERSONNEL
PM - K.A. POTOCKI   APPLIED PHYSICS LAB
PS - E.J. FREMOUW   PHYSICAL DYNAMICS, INC

BRIEF DESCRIPTION
The HILAT S/C (also known as P83-1) was a refurbished TRANSIT S/C which carried experiments intended to provide remote-sensing and in situ measurements of physical quantities likely to provide insight into the dynamics of plasma-density irregularity formation in the high-latitude ionosphere. The main objectives of the HILAT mission were (1) to extend the data base on irregularity strength and three-dimensional shape, (2) to probe several hypotheses about the development, transport, and decay of scintillation-producing irregularities, (3) to document the role of convective instabilities at high latitudes, and (4) to describe the role of peculiarly high-latitude influences such as particle precipitation and other aspects of ionospheric/magnetospheric coupling. The satellite was three-axis stabilized by means of a TRANSIT gravity-gradient boom and an added momentum wheel for yaw stabilization. The altitude was selected to be sufficiently high for scintillation and imager operation but low enough for the various in situ measurements. The inclination was chosen to give overhead passes nearly along the geomagnetic meridian at the preferred receiving locations. The orbit precessed 24 hours in approximately 6 months, so that observations during all hours of the day and night were possible in roughly one calendar season.

------- HILAT, HARDY---

INVESTIGATION NAME- ELECTRON SPECTROMETER

NSSDC ID- 83-063A-04   INVESTIGATIVE PROGRAM
                              APPLICATIONS

                              INVESTIGATION DISCIPLINE(S)
                              MAGNETOSPHERIC PHYSICS
                              IONOSPHERES
                              PARTICLES AND FIELDS

PERSONNEL
PI - D.A. HARDY   USAF GEOPHYS LAB

BRIEF DESCRIPTION
As a means for identifying primary ionization and energy input to the F layer, HILAT carried an electron spectrometer. The spectrometer could measure the number and energy flux of electrons in each of 16 channels in the energy range between 20 eV and 20 keV. The instrument contained sensors for viewing at the zenith, at the nadir, and at 40 deg to the zenith. It had three operating modes, including one designed for identification of finely structured precipitation. In this mode, eight channels from a given look direction could be sampled often enough to yield low-energy (20 to 600 eV) spectra with an in-track resolution of about 310 m.

------- HILAT, HUFFMAN---

INVESTIGATION NAME- AURORAL IONOSPHERIC MAPPER

NSSDC ID- 83-063A-05   INVESTIGATIVE PROGRAM
                              APPLICATIONS

                              INVESTIGATION DISCIPLINE(S)
                              MAGNETOSPHERIC PHYSICS
                              IONOSPHERES

PERSONNEL
PI - R.E. HUFFMAN   USAF GEOPHYS LAB
PI - C.I. MENG   APPLIED PHYSICS LAB

BRIEF DESCRIPTION
The Auroral/Ionospheric Mapper (AIM) instrument was intended to give simultaneous synoptic information through optical remote sensing of the ionosphere. The instrument consisted primarily of a vacuum-ultraviolet (VUV) imaging spectrometer which could operate in any of three modes. The most ambitious mode provided an image at any of six selectable wavelengths in the band 1150 to 2000 A, with a bandwidth of 30 A. Cross-track line scans of 134.4 deg by 1.5 deg with 336 pixels per line could yield nadir resolution of 3 by 13 km at 350-km altitude. The other two modes were fixed nadir-viewing ones with a field of view of 1.5 deg by 0.4 deg. One of these modes was a spectrophotometer mode in which a 30-A filter could be swept from 1150 to 2000 A. The other mode was a simple fixed-wavelength photometer mode. In addition to its VUV spectrophotometer, the AIM payload contained a pair of nadir-viewing visual-wavelength photometers. One operated at 3914 A and the other operated at 6300 A.

------- HILAT, POTEMRA---

INVESTIGATION NAME- THREE-AXIS FLUXGATE MAGNETOMETER

NSSDC ID- 83-063A-03   INVESTIGATIVE PROGRAM
                              APPLICATIONS

                              INVESTIGATION DISCIPLINE(S)
                              IONOSPHERES
                              MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - T.A. POTEMRA   APPLIED PHYSICS LAB

BRIEF DESCRIPTION
The three-axis fluxgate magnetometer was designed to measure the local vector magnetic field with a precision of 12 nT at a resolution of about 400 m. About 20 vector samples per second could be measured.

------- HILAT, RICH--

INVESTIGATION NAME- PLASMA MONITOR

NSSDC ID- 83-063A-02   INVESTIGATIVE PROGRAM
                              APPLICATIONS

                              INVESTIGATION DISCIPLINE(S)
                              MAGNETOSPHERIC PHYSICS
                              IONOSPHERES
                              PARTICLES AND FIELDS

PERSONNEL
PI - F.J. RICH   USAF GEOPHYS LAB
OI - W.R. HANSON   U OF TEXAS, DALLAS
OI - R.A. HEELIS   U OF TEXAS, DALLAS

BRIEF DESCRIPTION
This payload was designed to provide several in situ measurements related to plasma density irregularities in the ionosphere and consisted of the following three instruments: a Langmuir probe, a retarding-potential analyzer (RPA), and an ion drift meter. These instruments were mostly of proven design. Once in 64 seconds, a 2-s voltage sweep of the Langmuir probe was made to obtain direct measurements of the electron density and temperature and refinement of the RPA

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measurements, including assessment of the spacecraft potential. Between sweeps, the Langmuir-probe voltage was held in the electron saturation region and current was employed to measure plasma-density fluctuations. Its output was sampled 32 times per second, logarithmically amplified, and passed through a bank of filters centered at 70, 120, 700, and 2200 Hz. The filter outputs were detected and sampled once per second to give samples of, respectively, 100-m, 60-m, 10-m, and 3-m irregularity strength at the satellite altitude (830 km), with precisions of about plus or minus 1% and resolutions of about 7 km. The RPA measured the plasma density with a precision of about plus or minus 25% and a spatial resolution of about 4.7 km by sensing ions during 28 rapid voltage sweeps in a 64-s operating sequence. In this RPA sequence, there were also slower sweeps for providing more accurate measurements of ion temperature and dominant-ion mass. The in-track ion drift speed was measured with the RPA three times every 2 seconds, with a resolution of about 4.7 km and a precision of about 200 m/s. The ion drift meter measured the cross-track drift velocity at the rate of 16 vectors per second with a resolution of about 460 m and a precision of about 30 m/s. From these measurements of ion drift, the local convective electric field intensity could be determined.

------- HILAT, RINO--

INVESTIGATION NAME- COHERENT BEACON

NSSDC ID- 83-063A-01 INVESTIGATIVE PROGRAM APPLICATIONS

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - C.L.	RINO	SRI INTERNATIONAL
OI - P.A.	FORSYTH	WESTERN ONTARIO U

BRIEF DESCRIPTION

The coherent beacon experiment used both phase measurements and amplitude measurements to enhance the utility of scintillation measurements for the remote sensing of plasma density irregularities in the ionosphere. The experiment could transmit coherently on the following five frequencies: one at VHF (138 MHz), three at UHF (390, 413, and 536 MHz), and one at L band (1239 MHz). Complex-signal scintillation measurements were possible at both VHF and UHF. The triplet of UHF signals was used to obtain the total electron content (TEC) from measurements of the second difference of phase. The L-band signal served as a phase reference for the VHF and UHF scintillation measurements and could also be used for observations of amplitude scintillation at L band. Use of a moderate gain (about 9 dB) broad-beam steerable antenna allowed the measurement of minimum detectable phase fluctuations at UHF and VHF of 6 deg at low elevations and of about 1 deg overhead. These values are for post-detection bandwidths of 100 Hz, corresponding to a sampling resolution of about 30 m in an overhead phase screen at 350-km altitude. A considerably narrower post-detection bandwidth value was used for TEC measurements, yielding a minimum detectable value on the order of 1E15 electrons/sq m with an overhead sampling interval of about 3 km in the F layer.

************************ HINOTORI ************************

SPACECRAFT COMMON NAME- HINOTORI
ALTERNATE NAMES- ASTRONOMICAL SATELLITE-A, ASTRO-A
12307

NSSDC ID- 81-017A

LAUNCH DATE- 02/21/81 WEIGHT- 188. KG
LAUNCH SITE- KAGOSHIMA SPACE CENTER, JAPAN
LAUNCH VEHICLE- M-3S

SPONSORING COUNTRY/AGENCY
JAPAN ISAS

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 02/22/81
ORBIT PERIOD- 96.2 MIN	INCLINATION- 31.3 DEG
PERIAPSIS- 548. KM ALT	APOAPSIS- 603. KM ALT

PERSONNEL

PM - Y.	TANAKA	ISAS
PS - K.	TANAKA	U OF TOKYO

BRIEF DESCRIPTION

The main objective of the HINOTORI mission was the detailed study of solar flares during solar maximum. Principal investigations were (1) imaging of solar flare X rays in the range 10 to 40 keV by means of rotating modulation collimators and (2) spectroscopy of X-ray emission lines from highly ionized iron in solar flares in the range 1.7 to 2.0 A by means of a Bragg spectrometer. Wavelength scanning was achieved by the spacecraft revolution, with an offset pointing of the spin axis with respect to the sun. Investigations (1) and (2) each had a time resolution of 6 s. In addition, the following investigations were included: three solar flare X-ray monitors that recorded the time profile and spectrum of the X-ray flares in the range 2 to 20 keV, a solar flare gamma-ray detector for the range 0.2 to 9.0 MeV, a particle detector that monitored electron flux above 100 keV, and plasma probes for the measurement of electron density and temperature.

------- HINOTORI, HIRAO--

INVESTIGATION NAME- PLASMA PROBES

NSSDC ID- 81-017A-06 INVESTIGATIVE PROGRAM SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
SPACE PLASMAS

PERSONNEL

PI - K.	HIRAO	ISAS
PI - H.	OYA	U OF TOHOKU
OI - K.	OYAMA	ISAS
OI - T.	TAKAHASHI	U OF TOHOKU

BRIEF DESCRIPTION

This experiment used plasma probes to measure electron density and electron temperature during the solar maximum period.

------- HINOTORI, KONDO--

INVESTIGATION NAME- SOLAR FLARE GAMMA-RAY DETECTOR IN 0.2-9.0 MEV RANGE

NSSDC ID- 81-017A-04 INVESTIGATIVE PROGRAM SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - I.	KONDO	U OF TOKYO
PI - K.	OKUDAIRA	RIKKYO U
OI - Y.	HIRASHIMA	RIKKYO U
OI - M.	YOSHIMORI	RIKKYO U

BRIEF DESCRIPTION

This experiment measured gamma rays from solar flares in the energy range 0.2 to 9.0 MeV with a scintillation counter.

------- HINOTORI, MATSUOKA--

INVESTIGATION NAME- TIME PROFILE AND SPECTRA OF X-RAY FLARES IN THE 2-20 KEV RANGE

NSSDC ID- 81-017A-03 INVESTIGATIVE PROGRAM SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - M.	MATSUOKA	ISAS
OI - K.	KOYAMA	ISAS
OI - H.	INOUE	ISAS
OI - Y.	TANAKA	ISAS

BRIEF DESCRIPTION

This experiment used a gas scintillation proportional counter to record time profiles and spectra of solar X-ray flares in the 2- to 20-keV and above 20-keV ranges.

------- HINOTORI, TAKAKURA--

INVESTIGATION NAME- SOLAR FLARE 5-40 KEV X-RAYS USING ROTATING MODULATION COLLIMATOR IMAGING

NSSDC ID- 81-017A-01 INVESTIGATIVE PROGRAM SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - T.	TAKAKURA	ISAS
OI - S.	MIYAMOTO	OSAKA U
OI - Y.	OGAWARA	ISAS
OI - K.	OKI	U OF TOKYO
OI - T.	MURAKAMI	ISAS
OI - S.	TSANETA	ISAS

BRIEF DESCRIPTION

This experiment used rotating modulation collimators to image solar flare X rays in the energy range of 10 to 40 keV. The time resolution was 6 s.

------- HINOTORI, TAKEUCHI--

INVESTIGATION NAME- ELECTRON FLUX ABOVE 100 KEV PARTICLE DETECTOR MONITOR

NSSDC ID- 81-017A-05 INVESTIGATIVE PROGRAM SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - H.	TAKEUCHI	INST PHYS + CHEM RES
OI - T.	IMAI	INST PHYS + CHEM RES
OI - T.	KOHNO	INST PHYS + CHEM RES

BRIEF DESCRIPTION

This experiment used a pair of proportional counters to monitor solar electron flux above 100 keV.

------- HINOTORI, TANAKA-------

INVESTIGATION NAME- SOLAR FLARE X-RAY BRAGG SPECTROSCOPY IN 1.7-2.0 A RANGE

NSSDC ID- 81-017A-02 INVESTIGATIVE PROGRAM SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S) SOLAR PHYSICS

PERSONNEL

PI - K.	TANAKA	ISAS
OI - F.	MORIYAMA	ISAS
OI - K.	NISHI	U OF TOKYO

BRIEF DESCRIPTION

This experiment used a Bragg spectrometer to study the spectroscopy of X-ray emission lines from highly ionized iron in solar flares. The spectral range covered was 1.7 to 2.0 A. Wavelength scanning was achieved by spacecraft rotation with the spin axis offset slightly from the sun. The time resolution was 6 s.

**************************** IK BULGARIA 1300 ******************

SPACECRAFT COMMON NAME- IK BULGARIA 1300
ALTERNATE NAMES- INTERCOSMOS BULGAR 1300, 12645

NSSDC ID- 81-075A

LAUNCH DATE- 08/07/81 WEIGHT- KG
LAUNCH SITE-
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY

BULGARIA	BAS
U.S.S.R.	INTERCOS

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 08/08/81
ORBIT PERIOD- 101.9 MIN	INCLINATION- 81.2 DEG
PERIAPSIS- 825. KM ALT	APOAPSIS- 906. KM ALT

PERSONNEL

PM - A.G.	IOSIPHIAN	INTERCOSMOS
PM - K.B.	SERAFIMOV	CLSR-BAS
PS - M.M.	GOGOSHEV	CLSR-BAS
PS - I.	KUTIEV	CLSR-BAS
PS - V.M.	BALEBANOV	IKI

BRIEF DESCRIPTION

The spacecraft contained a set of plasma, particles, fields, and optical experiments that were designed and constructed in Bulgaria. The spacecraft was three-axis stabilized with the negative Z-axis pointing toward the center of the earth and the X-axis pointing along the velocity vector. The outer skin of the spacecraft, including the solar panels, was coated with a conducting material in order to allow the proper measurement of electric fields and low energy plasma. Both active and passive thermal control were employed. The solar panels supplied 2 kW and batteries were used during eclipse periods. There were two tape recorders, each with a capacity of 60 megabits. The transmitter radiated about 10 W in the 130-MHz band.

------- IK BULGARIA 1300, ARSHINKOV-------

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETER

NSSDC ID- 81-075A-11 INVESTIGATIVE PROGRAM SCIENCE

INVESTIGATION DISCIPLINE(S) MAGNETOSPHERIC PHYSICS PARTICLES AND FIELDS

PERSONNEL

PI - I.	ARSHINKOV	CLSR-BAS
PI - A.	BOCHEV	CLSR-BAS
OI - L.	JUSGOV	IZMIRAN

BRIEF DESCRIPTION

The instrument consisted of three fluxgate magnetometers that extended from the spacecraft along the negative Z-axis to obtain the vector field. The range of field intensity covered was plus or minus 64,000 nT with a resolution of 2 nT.

------- IK BULGARIA 1300, BANKOV-------

INVESTIGATION NAME- ION DRIFT METER AND RETARDING POTENTIAL ANALYZER

NSSDC ID- 81-075A-01 INVESTIGATIVE PROGRAM SCIENCE

INVESTIGATION DISCIPLINE(S) IONOSPHERES PARTICLES AND FIELDS

PERSONNEL

PI - L.	BANKOV	CLSR-BAS
OI - B.	KIROV	CLSR-BAS
OI - M.G.	GUSHEVA	CLSR-BAS
OI - V.G.	ISTOMIN	IKI

BRIEF DESCRIPTION

The instrument consisted of a Retarding Potential Analyzer (RPA) and an Ion Drift Meter (IDM) that pointed out along the spacecraft X axis. This set of instruments was capable of measuring the three components of the ion velocity vector from 0.1 to 5 km/s, the ion density from 1.E2 to 1.E6 per cc, the ion temperature from 600 to 10,000 deg K, plasma irregularities from 0.1 to 100%, the photoelectron energy range from 1 to 30 eV, and the mass range from 1 to 56 u. For more details on the IDM see L. G. Bankov et al., Adv. Space Res. v. 2, n. 7, pp. 71-74, 1983.

------- IK BULGARIA 1300, DACHEV-------

INVESTIGATION NAME- LOW-ENERGY ELECTRON-PROTON ELECTROSTATIC ANALYZER ARRAY IN 3 ORTHOGONAL DIRECTIONS

NSSDC ID- 81-075A-05 INVESTIGATIVE PROGRAM SCIENCE

INVESTIGATION DISCIPLINE(S) PARTICLES AND FIELDS MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - TS.	DACHEV	CLSR-BAS
OI - Y.	MATVIYCHUK	CLSR-BAS
OI - I.	IVANOV	CLSR-BAS
OI - M.	TELZOV	IKI

BRIEF DESCRIPTION

The instrument consisted of three sets of electrostatic analyzers (ESA); each set had three ESAs, one to measure protons and two to measure electrons. The angular field of view for each individual analyzer was 7 deg x 24 deg. One set viewed out along the spacecraft Z axis and the other two along perpendicular axes in the spacecraft X-Y plane at azimuthal angles of 50 and 140 deg. The energy per charge range from 0.2 to 15 keV/Q could be covered by up to 16 channels/s and the energy resolution adjusted to 0.1, 0.2, or 0.3. The flux range was 1.E4 to 1.E9 particles/(sq cm-sr-keV-s).

------- IK BULGARIA 1300, GOGOSHEV-------

INVESTIGATION NAME- VISIBLE AIRGLOW PHOTOMETERS

NSSDC ID- 81-075A-08 INVESTIGATIVE PROGRAM SCIENCE

INVESTIGATION DISCIPLINE(S) ATMOSPHERIC PHYSICS PLANETARY ATMOSPHERES

PERSONNEL

PI - M.M.	GOGOSHEV	CLSR-AO
OI - N.P.	PETKOV	CLSR-AO
OI - TS.N.	GOGOSHEVA	CLSR-AO
OI - A.	KUZMIN	IKI

BRIEF DESCRIPTION

The instrument consisted of two optical channels with interference filters at wavelengths (in A) of 4278, 4861, 5577, 6300, 6345 and 7320. The field of view of one channel was 3 deg. The second channel viewed plus and minus 15 deg from the nadir in 6300 A and the viewing was done by a mirror scanning over this range so that an image of the upper atmosphere in the red line of oxygen was obtained. The nadir was the spacecraft negative Z axis. The sensitivity range was 10 rayleighs to 100 kilorayleighs. For more details on this instrument see M. Gogoshev et al., Adv. Space Res., v. 2, n. 7, pp. 115-120, 1983.

------- IK BULGARIA 1300, GOGOSHEV-------

INVESTIGATION NAME- WAVELENGTH SCANNING UV PHOTOMETER

NSSDC ID- 81-075A-09 INVESTIGATIVE PROGRAM SCIENCE

INVESTIGATION DISCIPLINE(S) ATMOSPHERIC PHYSICS PLANETARY ATMOSPHERES

PERSONNEL

PI - M.M.	GOGOSHEV	CLSR-AO
OI - ST.I.	SARGOICHEV	CLSR-AO
OI - B.	MENDEVA	CLSR-BAS
OI - L.P.	SMIRNOVA	IKI

BRIEF DESCRIPTION
The instrument consisted of a lined grating spectrometer that scanned from 1150 to 2600 A with a resolution of 10 A. The field of view was conical with a half angle of 4.5 deg centered on the nadir, which was the spacecraft negative Z-axis. The intensity range covered from 80 rayleighs to 200 kilorayleighs. The instrument was capable of measuring the nightglow and the dayglow atmospheric spectra.

------- IK BULGARIA 1300, IVANOVA------------------------------

INVESTIGATION NAME- SPHERICAL ELECTROSTATIC ION TRAP

NSSDC ID- 81-075A-02 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL

PI - T.	IVANOVA	CLSR-BAS
OI - T.	SAMARDZHIEV	CLSR-BAS
OI - S.	HALOVA	CLSR-BAS
OI - G.L.	GDALEVICH	IKI

BRIEF DESCRIPTION
The instrumentation consisted of two spherical electrostatic probes. The first was a three-electrode device, with a floating potential on the outer grid, that measured the plasma density fluctuations. The outer diameter of this probe was 60 mm and its optical transparency was 44%. The collector current was measured in the range of 1.E-10 to 1.E-6 A and the outer grid potential was measured. The second probe was a four-electrode (three grids) device with a sawtooth voltage applied to the middle grid that sat on a step of 0, -4, -8, or -12 V, depending on what the potential of the outer floating grid was. The dynamic range of the collector current was 1.E-7 to 1.E-11 broken into four ranges. The first and second derivatives of the ion current were obtained to provide ion temperatures in the range of 500 to 5000 deg K and an ion density of 1.E2 to 1.E6 per cc for each ion species that could be determined. The outer diameter of this probe was 70 mm and its optical transparency was 27%. For more details on this instrument see T. N. Ivanova et al., Adv. Space Res., v. 2, n. 7, pp. 21-25, 1983.

------- IK BULGARIA 1300, IVANOVA------------------------------

INVESTIGATION NAME- CYLINDRICAL LANGMUIR PROBE

NSSDC ID- 81-075A-03 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL

PI - T.	IVANOVA	CLSR-BAS
OI - K.	GEORGIEVA	CLSR-BAS
OI - V.F.	GUBSKI	IKI

BRIEF DESCRIPTION
The instrumentation consisted of a cylindrical Langmuir probe, 14 cm long and 4 mm in diameter, that was capable of measuring the electron temperature from 1.E3 to 1.E4 deg K and the electron density from 5.E2 to 3.E5 per cc. The probe viewed along the spacecraft negative Z axis.

------- IK BULGARIA 1300, KAZAKOV------------------------------

INVESTIGATION NAME- PROTON SOLID-STATE TELESCOPE

NSSDC ID- 81-075A-07 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - K.	KAZAKOV	CLSR-BAS
OI - I.	GEORGIEV	CLSR-BAS
OI - N.	NIKOLAEVA	IKI

BRIEF DESCRIPTION
The instrumentation consisted of a solid-state telescope that viewed out along the spacecraft Z axis and measured protons from 90 keV to 1 MeV in four channels.

------- IK BULGARIA 1300, MARKOV------------------------------

INVESTIGATION NAME- DOUBLE SPHERICAL ELECTRON TEMPERATURE PROBES

NSSDC ID- 81-075A-04 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL

PI - V.	MARKOV	CLSR-BAS
OI - D.	TEODOSIEV	CLSR-BAS

BRIEF DESCRIPTION
The instrumentation consisted of a double probe that viewed along the spacecraft X axis. The gold spherical sensors were capable of measuring the electron temperature from 500 to 6,000 deg K and the spacecraft potential from -30 to +5 V.

------- IK BULGARIA 1300, NENOVSKI------------------------------

INVESTIGATION NAME- ION ENERGY-MASS COMPOSITION ANALYZERS

NSSDC ID- 81-075A-06 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - P.	NENOVSKI	CLSR-BAS
OI - R.	KOLEVA	CLSR-BAS
OI - J.	SEMKOVA	CLSR-BAS
OI - V.	SMIRNOV	IKI
OI - O.L.	VAISBERG	IKI

BRIEF DESCRIPTION
The instrument consisted of two separate analyzers: the low-energy one viewed out along the spacecraft X axis (along the velocity vector of the spacecraft) and the high-energy one along the Z axis. The mass range for both devices was 1 to 64 u. The electrostatic analyzer portion of the low-energy unit allowed ions with a range from 1 to 27 eV/Q to enter the magnetic analyzer. The energy resolution was 0.055; the field of view was 1 deg x 6 deg; and the flux range covered was 1.E5 to 1.E10 ions/(sq cm-sr-eV-s). The high-energy unit had the following parameters: E/Q range from 0.2 to 8 keV/Q; energy resolution of 0.07; and flux range 5.E5 to 1.E9 ions/(sq cm-sr-eV-s). For more details about this instrument see P. Nenovski et al., Adv. Space Res., v. 2, n. 7, pp. 27-30, 1983.

------- IK BULGARIA 1300, STANEV------------------------------

INVESTIGATION NAME- TRIAXIAL SPHERICAL VECTOR ELECTRIC FIELD PROBES

NSSDC ID- 81-075A-10 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - G.	STANEV	CLSR-BAS
OI - D.	TEODOSIEV	CLSR-BAS
OI - M.	PETRUNOVA	CLSR-BAS
OI - M.	PETRUNOVA	CLSR-BAS
OI - V.	CHMYREV	IZMIRAN

BRIEF DESCRIPTION
This investigation involved the measurement of (1) the quasistatic vector electric field, (2) the spacecraft potential from -10 to + 2 V, (3) the vector electric and magnetic fields in the frequency range 0.2 to 6.5 Hz, (4) the X or Z electric field component (determined by ground command) over the frequency range 0.03 to 16 kHz with a dynamic range of 80 dB, and (5) the Y component of the magnetic field, over the same frequency and dynamic range as in (4). The double probe method was used for electric fields; four spherical probes covered with vitreous carbon were placed at the ends of 4.5-m booms to serve as the sensors. A triaxial fluxgate magnetometer with a frequency-dependent feedback loop was employed as the sensor for the frequency range of 0.2 to 6.5 Hz while a search-coil magnetometer was used for the high frequency range. The sensitivity of the DC electric field measurements was 0.6 mV/m while it was 0.01 mV/m for the 0.2 to 6.5 Hz range. In this range the magnetic field sensitivity was 3.E-2 nT. There were eight bandpass filters centered at (in Hz) 33, 70, 140, 560, 1200, 4900, 9300, and 15000 to measure wave amplitudes. In addition, two parallel correlators were used to determine autocorrelation functions in the range 0.1 to 5 kHz. For further details on this instrument see G. Stanev et al., Adv. Space Res., v. 2, n. 7, pp. 43-48, 1983.

.... IMP-J ....

SPACECRAFT COMMON NAME- IMP-J
ALTERNATE NAMES- PL-723A, IMP 8
EXPLORER 50, 6893

NSSDC ID- 73-078A

LAUNCH DATE- 10/26/73 WEIGHT- 371. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 10/29/73
ORBIT PERIOD- 17286. MIN INCLINATION- 28.7 DEG
PERIAPSIS- 141224. KM ALT APOAPSIS- 288940. KM ALT

PERSONNEL

MG - M.A.	CALABRESE	NASA HEADQUARTERS
SC - M.J.	WISKERCHEN	NASA HEADQUARTERS
PM - J.P.	CORRIGAN	NASA-GSFC
PS - J.H.	KING	NASA-GSFC

BRIEF DESCRIPTION

IMP 8 (Explorer 50), the last satellite of the IMP series, was a drum-shaped spacecraft, 135.6 cm across and 157.4 cm high, instrumented for interplanetary and magnetotail studies of cosmic rays, energetic solar particles, plasma, and electric and magnetic fields. Its initial orbit was more elliptical than intended, with apogee and perigee distances of about 45 and 25 earth radii. Its eccentricity decreased after launch. The spacecraft spin axis was normal to the ecliptic plane, and the spin rate was 23 rpm. The data telemetry rate was 1600 bps. The objectives of the extended IMP-8 operations (after 1981) were (1) to provide solar wind parameters as input for magnetospheric studies and as a 1-AU baseline for deep space studies, (2) to add 30-40 RE IMP data to simultaneous ISEE 1, 2, and 3 data for studies of magnetospheric boundary and tail phenomena, and of the phenomena upstream of the bow shock, and (3) to continue solar cycle variation studies with a single set of well-calibrated and understood instruments.

------- IMP-J, AGGSON ---

INVESTIGATION NAME- ELECTROSTATIC FIELDS

NSSDC ID- 73-078A-11 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - T.L.	AGGSON	NASA-GSFC
OI - J.P.	HEPPNER	NASA-GSFC

BRIEF DESCRIPTION

The instrument was designed to measure ambient electric fields in the solar wind and the earth's magnetosheath up to 1 kHz in frequency. The sensor consisted of a pair of 70-m wire antennas (140 m, tip-to-tip), which were held rigid by centrifugal force due to satellite spin (about 24 rpm). The wires were insulated from the plasma, except for their short outer sections, to remove the active probe area from the spacecraft sheath. The antenna served as a double floating probe, and measurements were obtained every 1/4 spacecraft revolution (about 0.75 s). ULF and VLF measurements were obtained using seven 60% bandwidth filters with center frequencies logarithmically spaced from 1 Hz to 1 kHz. These frequency channels had an intrinsic sensitivity of 1.0E-5 V/m, and a peak range of 1.0E-2 V/m. However, the effective low-frequency filter threshold was determined by interference due to harmonics of the spacecraft spinning within an asymmetric sheath. The other major limitation was also due to sheath effect. Whenever the electron plasma density was less than about 10 particles/cc, the sheath overlapped the active antenna portions and precluded meaningful measurements of ambient conditions.

------- IMP-J, BAME ---

INVESTIGATION NAME- SOLAR PLASMA ELECTROSTATIC ANALYZER

NSSDC ID- 73-078A-10 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

PI - S.J.	BAME	LOS ALAMOS NAT LAB
OI - J.R.	ASBRIDGE	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

A hemispherical electrostatic analyzer measured the directional intensity of positive ions and electrons in the solar wind, magnetosheath, and magnetotail. Ions as heavy as oxygen were resolved when the solar wind temperature was low. Energy analysis was accomplished by charging the plates to known voltage levels and allowing them to discharge with known RC time constants. In the solar wind, positive ions from 200 eV to 5 keV (15% spacing, 3% resolution) and electrons from 5 eV to 1 keV (30% spacing, 15% resolution) were studied. In the magnetosheath, positive ions from 200 eV to 5 keV (15% spacing, 3% resolution) and from 200 eV to 20 keV (30% spacing, 15% resolution) and electrons from 5 eV to 1 keV (30% spacing, 15% resolution) were studied. In the magnetotail, positive ions from 200 eV to 20 keV (30% spacing, 15% resolution) and electrons from 5 eV to 1 keV (30% spacing, 15% resolution) and from 100 eV to 20 keV (15% resolution) were studied.

------- IMP-J, BRIDGE ---

INVESTIGATION NAME- SOLAR PLASMA FARADAY CUP

NSSDC ID- 73-078A-02 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - H.S.	BRIDGE	MASS INST OF TECH
OI - A.J.	LAZARUS	MASS INST OF TECH
OI - J.H.	BINSACK	MASS INST OF TECH
OI - E.F.	LYON	MASS INST OF TECH

BRIEF DESCRIPTION

A modulated split-collector Faraday cup, perpendicular to the spacecraft spin axis, was used to study the directional intensity of positive ions and electrons in the solar wind, transition region, and magnetotail. Electrons were studied in eight logarithmically equispaced energy channels between 17 eV and 7 keV. Positive ions were studied in eight channels between 50 eV and 7 keV. A spectrum was obtained every eight spacecraft revolutions. Angular information was obtained in either 15 equally spaced intervals during a 360-deg revolution of the satellite or in 15 angular segments centered more closely about the spacecraft-sun line.

------- IMP-J, FRANK ---

INVESTIGATION NAME- MEASUREMENT OF LOW-ENERGY PROTONS AND ELECTRONS

NSSDC ID- 73-078A-04 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS
INTERPLANETARY PHYSICS

PERSONNEL

PI - L.A.	FRANK	U OF IOWA

BRIEF DESCRIPTION

This experiment was designed to measure the energy spectra of low-energy electrons and protons in the geocentric range of 30 to 40 earth radii to give further data on geomagnetic storms, aurora, tail and neutral sheet, and other magnetospheric phenomena. The detector was a dual-channel, curved-plate electrostatic analyzer (LEPEDEA - low energy proton and electron differential energy analyzer) with 16 energy intervals between 5 eV and 50 keV. It had an angular field of view of 9 deg by 25 deg. The detector could be operated in one of two modes: (1) one providing good angular resolution (16 directions for each particle energy band) once each 272 s, and (2) the other providing good temporal resolution in which the entire energy range in four directions was measured every 68 s. For further details see L. A. Frank et al., J. Geophys. Res., v. 81, p. 5859, 1976.

------- IMP-J, GLOECKLER ---

INVESTIGATION NAME- SOLID-STATE DETECTORS

NSSDC ID- 73-078A-03 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - G.	GLOECKLER	U OF MARYLAND
OI - C.Y.	FAN	U OF ARIZONA
OI - D.K.	HOVESTADT	MPI-EXTRATERR PHYS

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BRIEF DESCRIPTION

This experiment was designed to determine the composition and energy spectra of low-energy particles observed during solar flares and 27-d recurrent events. The detectors used included (1) an electrostatic analyzer (to select particles of the desired energy per charge) combined with an array of windowless solid-state detectors (to measure the energy loss) and surrounded by an anticoincidence shield, and (2) a thin-window proportional counter, solid-state particle telescope. The experiment measured particle energies from 0.1 to 10 MeV per charge in 12 bands and uniquely identified positrons and electrons as well as nuclei with charges of Z from 1 to 8 (no charge resolution for Z greater than 8). Two 1000-channel pulse-height analyzers, one for each detector, were included in the experiment payload.

------- IMP-J, GURNETT ---

INVESTIGATION NAME- ELECTROSTATIC WAVES AND RADIO NOISE

NSSDC ID- 73-078A-12 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - D.A.	GURNETT	U OF IOWA
OI - T.L.	AGGSON	NASA-GSFC
OI - G.W.	PFEIFFER	U OF IOWA

BRIEF DESCRIPTION

A wide-band receiver was used to observe high-resolution frequency-time spectra, and a six-channel narrow-band receiver with a variable center frequency was used to observe wave characteristics. The receivers operated from three antenna systems. The first system contained a pair of long dipole antennas (one, extendable to about 124 m, normal to the spacecraft spin axis and the other antenna, extendable to about 6.1 m, along the spin axis). The second system contained a boom-mounted triad of orthogonal loop antennas. The third system consisted of a boom-mounted 0.51-m spin-axis dipole. The magnetic and electric field intensities and frequency spectra, polarization, and direction of arrival of naturally occurring radio noise in the magnetosphere were observed. Phenomena studied were the time-space distribution, origin, propagation, dispersion, and other characteristics of radio noise occurring across and on either side of the magnetospheric boundary region. The frequency range for electric fields was 0.3 Hz to 200 kHz, and for magnetic fields it was 20 Hz to 200 kHz.

------- IMP-J, KRIMIGIS ---

INVESTIGATION NAME- CHARGED PARTICLE MEASUREMENTS EXPERIMENT

NSSDC ID- 73-078A-08 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - S.M.	KRIMIGIS	APPLIED PHYSICS LAB
OI - T.P.	ARMSTRONG	U OF KANSAS
OI - J.A.	VAN ALLEN	U OF IOWA

BRIEF DESCRIPTION

Three solid-state detectors in an anticoincidence plastic scintillator observed electrons between 0.2 and 2.5 MeV; protons between 0.3 and 500 MeV; alpha particles between 2.0 and 200 MeV; heavy particles with Z values ranging from 2 to 5 with energies greater than 8 MeV; heavy particles with Z values ranging between 6 and 8 with energies greater than 32 MeV; and integral protons and alphas of energies greater than 50 MeV/nucleon, all with dynamic ranges of 1 to 1E+6 particles per (sq cm-s-sr). Five thin-window Geiger-Mueller tubes observed electrons of energy greater than 15 keV, protons of energy greater than 250 keV, and X rays with wavelengths between 2 and 10 A, all with a dynamic range of 10 to 1E+8 per (sq cm-s-sr). Particles and X rays, primarily of solar origin, were studied, but the dynamic range and resolution of the instrument also permitted observation of cosmic rays and magnetotail particles. For further details, see T. P. Armstrong et al., J. Geophys. Res., v. 83, p. 5198, 1978.

------- IMP-J, MCGUIRE ---

INVESTIGATION NAME- SOLAR AND COSMIC-RAY PARTICLES

NSSDC ID- 73-078A-09 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - R.	MCGUIRE	NASA-GSFC
OI - B.J.	TEEGARDEN	NASA-GSFC

BRIEF DESCRIPTION

The GSFC cosmic-ray experiment was designed to measure energy spectra, composition, and angular distributions of solar and galactic electrons, protons, and heavier nuclei up to Z=30. Three distinct detector systems were used. The first system consisted of a pair of solid-state telescopes that measured integral fluxes of electrons above 150, 350, and 700 keV and of protons above .05, .15, .50, .70, 1.0, 1.2, 2.0, 2.5, 5.0, 15, and 25 MeV. Except for the .05-MeV proton mode, all counting modes had unique species identification. The second detector system was a solid-state dE/dx vs E telescope that looked perpendicular to the spin axis. This telescope measured Z=1 to 16 nuclei with energies between 4 and 20 MeV/nucleon. Counts of particles in the 0.5- to 4-MeV/nucleon range, with no charge resolution, were obtained as counts in the dE/dx sensor but not in the E sensor. The third detector system was a three-element telescope whose axis made an angle of 39 deg with respect to the spin axis. The middle element was a CsI scintillator, while the other two elements were solid-state sensors. The instrument responded to electrons between 2 and 12 MeV and to Z=1 to 30 nuclei in the energy range 20 to 500 MeV/nucleon. For particles below 80 MeV, this instrument acted as a dE/dx vs E detector. Above 80 MeV, it acted as a bidirectional triple dE/dx vs E detector. Flux directionality information was obtained by dividing certain portions of the data from each detector into eight angular sectors. For further details, see B. J. Teegarden et al., Astrophys. J., v. 202, p. 815, 1975.

------- IMP-J, NESS ---

INVESTIGATION NAME- MAGNETIC FIELD EXPERIMENT

NSSDC ID- 73-078A-01 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - N.F.	NESS	NASA-GSFC
OI - C.S.	SCEARCE	NASA-GSFC
OI - J.B.	SEEK	NASA-GSFC

BRIEF DESCRIPTION

This experiment consisted of a boom-mounted triaxial fluxgate magnetometer designed to study the interplanetary and geomagnetic tail magnetic fields. Each sensor had three dynamic ranges of plus or minus 12, plus or minus 36, and plus or minus 108 nT. With the aid of a bit compaction scheme (delta modulation), 25 vector measurements were made and telemetered per second. The experiment operated normally from launch until mid-1975. On July 11, 1975, because of a range indicator problem, the experiment operation was frozen into the 36-nT range. The digitization accuracy in this range is about plus or minus 0.3 nT. On March 23, 1978, the sensor flipper failed. After that time, alternative methods of Z-axis sensor zero-level determination were required.

------- IMP-J, SIMPSON ---

INVESTIGATION NAME- SOLAR FLARE HIGH-Z/LOW-E AND LOW-Z ISOTOPE

NSSDC ID- 73-078A-07 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - J.A.	SIMPSON	U OF CHICAGO
OI - M.	GARCIA-MUNOZ	U OF CHICAGO

BRIEF DESCRIPTION

This experiment used two telescopes to measure the composition and energy spectra of solar (and galactic) particles above about 0.5 MeV/nucleon. The main telescope consisted of five collinear elements (three solid state, one CsI, and one sapphire Cerenkov) surrounded by a plastic anticoincidence shield. The telescope had a 60-deg, full-angle acceptance cone with its axis approximately normal to the spacecraft spin axis, permitting eight-sectored information on particle arrival direction. Four elements of the main telescope were pulse-height analyzed, and low- and high-gain modes could be selected by command to permit resolution of the elements H through Ni or of electrons and the isotopes of H and He and light nuclei. A selection-priority scheme was included to permit sampling of less abundant particle species under normal and solar-flare conditions. The low-energy telescope was essentially a two-element shielded solid-state detector with a 70-deg full-angle acceptance cone. The first element was pulse-height analyzed, and data were recorded by sectors.

------- IMP-J, STONE -------

INVESTIGATION NAME- ELECTRONS AND HYDROGEN AND HELIUM ISOTOPES

NSSDC ID- 73-078A-06 INVESTIGATIVE PROGRAM CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S) COSMIC RAYS

PERSONNEL
PI - E.C. STONE CALIF INST OF TECH
OI - R.E. VOGT CALIF INST OF TECH
OI - R.A. MEWALDT CALIF INST OF TECH

BRIEF DESCRIPTION
This experiment was designed to measure the differential energy spectra of the isotopes of hydrogen through oxygen from 2 to 40 MeV/nucleon, and of electrons from 0.2 to 5 MeV. The instrument consisted of a stack of 11 fully depleted silicon solid-state detectors surrounded by a plastic scintillator anticoincidence cup. The outer two solid-state detectors were annular, permitting measurements in both narrow-geometry (typical geometrical factor was 0.2 sq cm-sr) and wide-geometry (typical geometric factor was 1.5 sq cm-sr) coincidence modes. Anisotropy data (45-deg angular and 2^n-s temporal resolution) were obtained. For further details, see R. A. Mewaldt and E. C. Stone, Astrophys. J., v. 205, p. 93, 1976.

------- IMP-J, WILLIAMS -------

INVESTIGATION NAME- ENERGETIC ELECTRONS AND PROTONS

NSSDC ID- 73-078A-05 INVESTIGATIVE PROGRAM CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS
INTERPLANETARY PHYSICS

PERSONNEL
PI - D.J. WILLIAMS APPLIED PHYSICS LAB
OI - C.O. BOSTROM APPLIED PHYSICS LAB
OI - J.H. TRAINOR NASA-GSFC

BRIEF DESCRIPTION
The purposes of this investigation were (1) to study the propagation characteristics of solar cosmic rays through the interplanetary medium over the energy ranges indicated below, (2) to study electron and proton fluxes throughout the geomagnetic tail and near the flanks of the magnetosphere, and (3) to study the entry of solar cosmic rays into the magnetosphere. The instrumentation consisted of a three-element telescope employing fully depleted surface-barrier solid-state detectors and a magnet to deflect electrons. Two side-mounted detectors were used to measure the deflected electrons. Two additional detectors in separate mounts were used to measure charged particles above 15 keV (F), Z greater than or equal to 2 above 0.6 MeV (G1) and above 1.0 MeV (G2), and Z greater than or equal to 3 above 2.0 MeV (G3). The telescope measured protons in three ranges between 2.1 and 25 MeV (I4, I5, I6); Z greater than or equal to 1 in three ranges between 0.05 and 2.1 MeV (I1, I2, I3); alpha particles between 8.4 and 35.0 MeV in two ranges (I11, I12); Z greater than or equal to 2 between 2.2 and 8.4 MeV (I10); and a background channel (I9). Deflected electrons were measured in two ranges between 30 and 200 keV (I7, I8). A complete description of the instrument was given by D. J. Williams in NOAA Technical Report ERL 393-SEL 40, October 1977.

*************** INSAT 1B ***************

SPACECRAFT COMMON NAME- INSAT 1B
ALTERNATE NAMES- INDIAN NATIONAL SAT., 14318

NSSDC ID- 83-089B

LAUNCH DATE- 08/31/83 WEIGHT- 1152. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
INDIA ISRO

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 10/15/83
ORBIT PERIOD- 1440. MIN INCLINATION- 0.0 DEG
PERIAPSIS- 35680. KM ALT APOAPSIS- 35680. KM ALT

PERSONNEL
MG - J.P. SINGH ISRO SATELLITE CENTER
PM - P.P. KALE INDIA DEPT OF SPACE

BRIEF DESCRIPTION
The Insat 1B was the second spacecraft in the first generation Indian National Satellite System. The three-axis stabilized spacecraft, originally launched as an on-orbit back-up, replaced Insat 1A, which failed in late 1982. It was positioned in a geosynchronous orbit at 74 deg E with a host of ground stations throughout India. The Insat 1B satellite, built by the Ford Aerospace and Communications Corporation, was designed to provide combined telecommunications, direct TV broadcast, and meteorological service to India's civilian community over a 7-year-in-orbit lifespan. The telecommunications package provided two-way, long-distance telephone circuits and direct radio and TV broadcasting to the remotest areas of India. The meteorology package was comprised of a scanning very-high-resolution, two-channel radiometer (VHRR) to provide full-frame, full-earth coverage every 30 min. The visual channel (0.55-0.75 micrometers) had a 2.75-km resolution while the IR channel (10.5-12.5 micrometers) had an 11-km resolution. Using the Insat TV capability, early warnings of impending disasters (i.e., floods, storms, etc.) can directly reach the civilian population, even in remote areas. The Insat 1B also had a data channel for relaying meteorological, hydrological, and oceanographic data from unattended land-based or ocean-based data collection and transmission platforms.

------- INSAT 1B, IMD STAFF -------

INVESTIGATION NAME- VERY HIGH RESOLUTION RADIOMETER (VHRR)

NSSDC ID- 83-089B-01 INVESTIGATIVE PROGRAM APPLICATIONS

INVESTIGATION DISCIPLINE(S) METEOROLOGY

PERSONNEL
PI - IMD STAFF INDIA METEOROLOG. DEPT

BRIEF DESCRIPTION
The Very High Resolution Radiometer (VHRR) was a two-channel scanning instrument. Both channels gave full earth coverage with a full frame image every 30 min. The visible channel (10.5-12.5 micrometers) had a 2.75-km resolution, and the IR channel had an 11-km resolution. The half-hourly observations were used for monitoring weather systems over land and sea, i.e., observing cyclones and measuring sea surface and cloud top temperatures.

------- INSAT 1B, IMD STAFF -------

INVESTIGATION NAME- DATA COLLECTION AND TRANSMISSION RELAY

NSSDC ID- 83-089B-03 INVESTIGATIVE PROGRAM APPLICATIONS

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS
METEOROLOGY

PERSONNEL
PI - IMD STAFF INDIA METEOROLOG. DEPT

BRIEF DESCRIPTION
The data collection and transmission relay package consisted of a data channel operating at 402.75 MHz (earth-to-satellite) to provide for the relay of meteorological, hydrological, and oceanographic data from unattended land-based and ocean-based data collection and transmission platforms.

------- INSAT 1B, P & T STAFF -------

INVESTIGATION NAME- TELECOMMUNICATIONS PACKAGE

NSSDC ID- 83-089B-02 INVESTIGATIVE PROGRAM APPLICATIONS

INVESTIGATION DISCIPLINE(S) COMMUNICATIONS

PERSONNEL
PI - P & T STAFF INDIA POSTS & TELE DEP

BRIEF DESCRIPTION
The telecommunications package had 12 transponders operating at 5935-6425 MHz (earth-to-satellite) and 3710-4200 MHz (satellite-to-earth) for thick route, thin route, and remote area communication and TV program distribution. It also had two transponders operating at 5855-5935 MHz (earth-to-satellite) and 2555-2635 MHz (satellite-to-earth) for direct broadcasting to augment low-cost community TV sets in rural areas, radio-program distribution, national TV networking and disaster warning.

*************** IRAS ***************

SPACECRAFT COMMON NAME- IRAS
ALTERNATE NAMES- INFRA-RED ASTRONOM SAT, IR ASTRON. SAT. 13777

NSSDC ID- 83-004A

LAUNCH DATE- 01/25/83 WEIGHT- 1000. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

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SPONSORING COUNTRY/AGENCY

THE NETHERLANDS	NIVR
UNITED STATES	NASA-OSSA
UNITED KINGDOM	SERC

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 01/26/83
ORBIT PERIOD- 103. MIN	INCLINATION- 99.1 DEG
PERIAPSIS- 889. KM ALT	APOAPSIS- 903. KM ALT

PERSONNEL

MG - D.	WRUBLIK	NASA HEADQUARTERS
SC - N.W.	BOGGESS	NASA HEADQUARTERS
PM - G.F.	SQUIBB	NASA-JPL
PS - H.H.	AUMANN	NASA-JPL

BRIEF DESCRIPTION

The Infrared Astronomical Satellite (IRAS) was a mission with joint execution by the United States (NASA), the Netherlands, and the United Kingdom. The basic goal of this mission was to obtain a full-sky survey over the approximate wavelength range 8 to 120 micrometers with four broadband photometry channels. IRAS contained a 0.6-m Ritchey-Chretien telescope cooled by helium to a temperature of near 10 deg K. An array of 62 detectors was used to detect the infrared flux in bands centered at 12, 25, 60, and 100 micrometers. The noise equivalent flux densities were, respectively, 0.1, 0.1, 0.1, and 0.3 Jy (1 Jansky = 1E-26 W/sq m-Hz) in the four survey bands. The positions of galactic and extragalactic sources were determined to an accuracy of 0.5 arc-min. In addition to the focal-plane detector array used for the all-sky survey, a low-resolution spectrometer and a 60-and 100-micrometer chopped photometric channel were included on IRAS. To scan the sky for the survey, the satellite was rotated at a constant angular velocity perpendicular to the satellite-sun vector. IRAS could be pointed also at a selected celestial object for up to 12 min. This pointing ability permitted observations of selected objects with up to a factor of 10 increase in sensitivity or spatial resolution compared to that of the survey. IRAS ceased operations on November 21, 1983. Further discussion of the IRAS mission can be found in G. Neugebauer et. al., Science, v. 224, pp. 14-21, 1984, and the in entire March 1, 1984 issue of Astrophysical Journal Letters (v. 278, pp. L1-L85). The Joint IRAS Science Working Group (SWG) is listed in Appendix B5.

------- IRAS, JOINT IRAS SWG-------------------------------------

INVESTIGATION NAME- IR TELESCOPE

NSSDC ID- 83-004A-01

INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL
PI - JOINT IRAS SWG

BRIEF DESCRIPTION

The IRAS telescope system (TSY) consisted of the optical sub-system (OSS), electronic, cryogenic, structural and thermal sub-systems. The OSS consisted of a two-mirror Ritchey-Chretien folded-optics reflector telescope with an aperture of 57 cm and a focal length of 5.5 m. The FOV was slightly more than 1 deg and was diffraction limited at all wavelengths beyond 8 micrometers. The aperture was 41% obscured by the secondary mirror with a total effective area of 2024 sq cm. The focal plane assembly was a subassembly of 62 IR and 8 visible detectors mounted at the focal plane of the OSS. The total array consisted of eight IR color band modules and two visible band modules.

------- IRAS, JOINT IRAS SWG-------------------------------------

INVESTIGATION NAME- LOW RESOLUTION SPECTROMETER

NSSDC ID- 83-004A-02

INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL
PI - JOINT IRAS SWG

BRIEF DESCRIPTION

The Dutch additional experiment (DAX) consisted of a low-resolution spectrometer (LRS), a chopped-photometric-channels (CPC) long-wavelength photometer, and a short-wavelength channel (SWC) ac-coupled photometer. The LRS was used in combination with the survey instrument and measured spectra of point sources in the range 7.4 to 23 micrometers with a resolution of about 20. The CPC mapped IR sources in two bands, from 41 to 62.5 and from 84 to 114 micrometers, with a spatial resolution of 1.2 arc-min and could not be used simultaneously with the survey instrument. The SWC scanned with the nominal survey rate over a band of 4.1 to 8 micrometers with a 15-arc-s FOV and could be used with the survey instrument.

**************************** ISEE 1 ****************************

SPACECRAFT COMMON NAME- ISEE 1
ALTERNATE NAMES- IMP-K, 10422
MOTHER, INTNL SUN EARTH EXPL-A
ISEE-A

NSSDC ID- 77-102A

LAUNCH DATE- 10/22/77 WEIGHT- 340.2 KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 10/23/77
ORBIT PERIOD- 3446.4 MIN	INCLINATION- 28.7 DEG
PERIAPSIS- 281. KM ALT	APOAPSIS- 138120. KM ALT

PERSONNEL

MG - M.A.	CALABRESE	NASA HEADQUARTERS
SC - M.J.	WISKERCHEN	NASA HEADQUARTERS
PM - J.P.	CORRIGAN	NASA-GSFC
PS - K.W.	OGILVIE	NASA-GSFC
MO - R.O.	WALES	NASA-GSFC

BRIEF DESCRIPTION

The Explorer-class mother spacecraft, ISEE 1, was part of the mother/daughter/heliocentric mission which included the ISEE 1, ISEE 2, and ISEE 3 spacecraft. The purposes of the mission were (1) to investigate solar/terrestrial relationships at the outermost boundaries of the earth's magnetosphere, (2) to examine in detail the structure of the solar wind near the earth and the shock wave that forms the interface between the solar wind and earth, and (3) to continue the investigation of cosmic rays and solar flares in the interplanetary region near 1 AU. The mission thus extended the investigations of previous IMP spacecraft. The mother/daughter portion of the mission consisted of two spacecraft with a station-keeping capability in a highly eccentric earth orbit with apogee at 23 earth radii. The spacecraft maintained a small separation distance, and made simultaneous coordinated measurements to permit separation of spatial from temporal irregularities in the near-earth solar wind, the bow shock, and inside the magnetosphere. The spin rate was set at 19.75 rpm, differing slightly from that of the ISEE 2 spacecraft. For instrument descriptions written by the investigators, see IEEE Trans. on Geosci. Electron., v. GE-16, n. 3, July 1978.

------- ISEE 1, ANDERSON-------------------------------------

INVESTIGATION NAME- ELECTRONS AND PROTONS

NSSDC ID- 77-102A-10

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

PERSONNEL

PI - K.A.	ANDERSON	U OF CALIF, BERKELEY
OI - C.I.	MENG	APPLIED PHYSICS LAB
OI - F.V.	CORONITI	U OF CALIF, LA
OI - J.M.	BOSQUED	PAUL SABATIER U
OI - R.	PELLAT	CTR FOR THEORETIC PHYS
OI - G.K.	PARKS	U OF WASHINGTON
OI - R.P.	LIN	U OF CALIF, BERKELEY
OI - H.	REME	CESR

BRIEF DESCRIPTION

This experiment was designed to determine, by using identical instrumentation (see 77-102B) on the mother/daughter spacecraft, the spatial extent, propagation velocity, and temporal behavior of a wide variety of particle phenomena. Electrons were measured at 2 and 6 keV and in two bands: 8 to 200 keV and 30 to 200 keV. Protons were measured at 2 and 5 keV and in three bands: 8 to 200 keV, 30 to 200 keV, and 200 to 380 keV. The 30 keV threshold could be commanded to 15 or 60 keV. Identical instrumentation on each spacecraft consisted of a pair of surface-barrier semiconductor-detector telescopes (one with a foil and one without a foil) and four fixed-voltage cylindrical electrostatic analyzers (two for electrons and two for protons). Channel multipliers were used as detectors with the fixed-voltage analyzers. The telescopes had a viewing cone with a 40-deg half-angle, oriented at about 20 deg to the spin axis.

------- ISEE 1, BAME-------------------------------------

INVESTIGATION NAME- FAST PLASMA AND SOLAR WIND IONS

NSSDC ID- 77-102A-01

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - S.J.	BAME	LOS ALAMOS NAT LAB
OI - H.	MIGGENRIEDER	MPI-EXTRATERR PHYS
OI - K.	SCHINDLER	U OF BOCHUM
OI - J.R.	ASBRIDGE	LOS ALAMOS NAT LAB
OI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - H.J.	VOELK	MPI-NUCLEAR PHYS
OI - M.D.	MONTGOMERY	LOS ALAMOS NAT LAB
OI - G.	PASCHMANN	MPI-EXTRATERR PHYS
OI - W.C.	FELDMAN	LOS ALAMOS NAT LAB
OI - E.W.	HONES, JR.	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

This experiment was designed, in conjunction with a similar instrument (77-102B-01) provided by G. Paschmann of Max Planck Institute for flight on the daughter spacecraft, to study the plasma velocity distribution and its spatial and temporal variations in the solar wind, bow shock, magnetosheath, magnetopause, magnetotail, and magnetosphere. Protons from 50 eV to 40 keV and electrons from 5 eV to 20 keV were measured in one, two, and three dimensions by three 90-deg spherical electrostatic analyzers. The experiment, which utilized channeltron electron multipliers as detectors, operated in two ranges, with energy resolution for the several steps in each range of 10% of the center energy level.

------- ISEE 1, CLINE---

INVESTIGATION NAME- GAMMA-RAY BURSTS

NSSDC ID- 77-102A-14

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - T.L.	CLINE	NASA-GSFC
OI - D.K.	HOVESTADT	MPI-EXTRATERR PHYS
OI - B.J.	TEEGARDEN	NASA-GSFC
OI - G.	GLOECKLER	U OF MARYLAND

BRIEF DESCRIPTION

This experiment was designed to recognize and record the time history of gamma-ray bursts. Two sensors were used: a 4-cm-diameter, CsI scintillator system and a 6-sq-cm, solid-state (Cd Te) array. An intensity increase in either of the sensors could cause a trigger signal to occur, freezing the circulating memory of the immediate past counting-rate history and filling another memory with the counting rates for 1 min following the trigger signal. The time of the trigger signal and its location in the temporal history were also stored in memory. All stored information was then read out at a very low bit rate during the succeeding several hours. Three trigger signals were used based on total counts in 4 ms, 32 ms, and 256 ms. Six memories were used, three before and three after the trigger signal, yielding storage of 1/64, 1/8, and 1 min of data each to provide detailed rise-time information.

------- ISEE 1, FRANK---

INVESTIGATION NAME- HOT PLASMA

NSSDC ID- 77-102A-03

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - L.A.	FRANK	U OF IOWA
OI - V.M.	VASYLIUNAS	MPI-AERONOMY
OI - C.F.	KENNEL	U OF CALIF, LA

BRIEF DESCRIPTION

This experiment was designed to study, by means of identical instrumentation on the mother/daughter spacecraft, the spatial and temporal variations of the solar wind and magnetosheath electrons and ions. Protons and electrons in the energy range from 1 eV to 45 keV were measured in 64 contiguous energy bands with an energy resolution (delta E/E) of 0.16. A quadrispherical low-energy proton and electron differential energy analyzer (LEPEDEA), employing seven continuous channel electron multipliers in each of its two (one for protons and one for electrons) electrostatic analyzers was flown on both the mother and the daughter spacecraft. All but 2% of the 4-pi-sr solid angle was covered for particle velocity vectors. A GM tube was also included, with a conical field of view of 40-deg full-angle, perpendicular to the spin axis. This detector was sensitive to electrons with E>45 keV, and to protons with E>600 keV.

------- ISEE 1, GURNETT---

INVESTIGATION NAME- PLASMA WAVES

NSSDC ID- 77-102A-07

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

PERSONNEL

PI - D.A.	GURNETT	U OF IOWA
OI - F.L.	SCARF	TRW SYSTEMS GROUP
OI - R.W.	FREDRICKS	TRW SYSTEMS GROUP
OI - E.J.	SMITH	NASA-JPL

BRIEF DESCRIPTION

This experiment, in conjunction with a similar (but simpler) experiment (77-102B-05) on ISEE 2, was designed to measure wave phenomena occurring within the magnetosphere and solar wind. Three electric dipole antennas (215 m, 73.5 m, and 0.61 m) and a triaxial search-coil antenna were used. The instrumentation consisted of four main elements: (1) a narrow-band sweep-frequency receiver with 32 frequency steps in each of four bands from 100 Hz to 400 kHz, a complete sweep required 32 s; (2) a high-time-resolution spectrum analyzer with 20 channels from 5.62 Hz to 311 kHz for electric field and 14 identical channels from 5.62 Hz to 10 kHz for magnetic field information, the electric and magnetic channels were sampled simultaneously; (3) a wave-normal analyzer to provide components for computing the wave normal and the Poynting flux, this analyzer had a 10-Hz bandwidth, and covered 32 frequencies from 100 Hz to 5 kHz; and (4) a wide-band receiver to condition electric and magnetic waveforms for transmission to the ground via the special-purpose analog transmitter, this receiver also provided the signals for long-baseline-interferometer measurements between ISEE 1 and ISEE 2. There were two basic frequency channels: 10 Hz to 1 kHz and 650 Hz to 10 or 40 kHz. In addition, the frequency range could be shifted by a frequency-conversion scheme to any of eight ranges up to 2 MHz.

------- ISEE 1, HARVEY---

INVESTIGATION NAME- PLASMA DENSITY

NSSDC ID- 77-102A-08

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI - C.C.	HARVEY	PARIS OBSERVATORY
OI - M.	PETIT	CNET
OI - J.R.	MCAFEE	NOAA-ERL
OI - D.	JONES	BRITISH ANTARCTIC SURV
OI - J.M.	ETCHETO	CNET
OI - R.J.L.	GRARD	ESA-ESTEC
OI - R.E.	GENDRIN	CNET

BRIEF DESCRIPTION

This experiment measured the plasma electron density near the mother satellite and also the total electron content between the mother and the daughter spacecraft. The experiment consisted of two distinct parts. The mother spacecraft carried an experiment (the sounder) to detect resonances of the ambient plasma. After an antenna had been momentarily excited at one of the characteristic frequencies of the plasma in which it was immersed, a pronounced "ringing" was observed. These resonances occurred at the plasma frequency, the upper hybrid resonance, the cyclotron frequency and its harmonics, and the measurement of their frequencies permitted the determination of several plasma parameters, including the electron density. In this experiment, the transmitter was designed to step through 128 sub-bands, covering the characteristic resonance frequencies of the plasma, from 0.3 to 50.9 kHz, and from 0 to 353 kHz. The integrated density between the mother and the daughter was obtained from a second experiment (the propagation experiment) that measured the phase delay introduced by the ambient plasma onto a wave of frequency about 683 kHz transmitted from the mother and received on the daughter (experiment -06). The phase was compared against a phase-coherent signal transmitted from the mother to the daughter by modulation onto a carrier of frequency high enough to be unaffected by the ambient plasma (272.5 MHz). Due to perturbations to other experiments, active operation was on a limited duty cycle.

------- ISEE 1, HELLIWELL---

INVESTIGATION NAME- VLF WAVE PROPAGATION

NSSDC ID- 77-102A-13

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

ORIGINAL PAGE IS
OF POOR QUALITY

PERSONNEL
PI - R.A. HELLIWELL STANFORD U
OI - T.F. BELL STANFORD U

BRIEF DESCRIPTION
This experiment was intended to provide data to study interactions between discrete VLF waves and energetic particles in the magnetosphere. The VLF waves were produced by a ground-based transmitter. Injection of the waves beyond the ionosphere was assured by transmitter location in a region where the magnetic lines of force are open: in this case, the Siple station, Antarctica. The injected signal and any stimulated VLF emissions were recorded through a loop antenna by a 1- to 32-kHz broadband receiver on the satellite. The observed parameters were the intensities of received radio frequency waves as a function of time.

------- ISEE 1, HEPPNER---

INVESTIGATION NAME- DC ELECTRIC FIELD

NSSDC ID- 77-102A-11 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

PERSONNEL
PI - J.P. HEPPNER NASA-GSFC
OI - T.L. AGGSON NASA-GSFC
OI - N.C. MAYNARD USAF GEOPHYS LAB
OI - D.A. GURNETT U OF IOWA
OI - D.P. CAUFFMAN LOCKHEED PALO ALTO

BRIEF DESCRIPTION
This experiment was intended to study quasi-static electric fields and low-frequency plasma waves in the plasmasphere, magnetosphere, magnetosheath, and solar wind. The double-probe floating-potential technique was applied using long-wire antenna probes with an effective electric field baseline of 179 m. The dc differential voltage was measured 8 or 32 times per s, depending on bit rate. In addition, the dc field was measured at selected azimuthal angles relative to the sun and the magnetic field, and the peak value of delta V and its azimuthal angles were measured. Low-frequency waves were measured in eight frequency bands as follows: 0.19 to 0.6, 0.6 to 1.9, 1.9 to 6, 6 to 19, 19 to 60, 60 to 190, 190 to 600, and 600 to 1900 Hz. The dc-mode measurements had a two-step, variable-gain amplifier controlled from the ground. The resolution in the highest gain state was 0.5E-6 V/m. The ac measurement electronics consisted of two amplifier sections. One amplifier was used for low-frequency channels, and one for high-frequency channels. Gain lines for each amplifier were independently controllable from the ground. In the highest-gain mode, each analyzer channel had a sensitivity of 0.04E-6 V/m (rms). The experiment could be run in either a sun-sensor synchronized or a free state as controlled from the ground. In addition, the ac portion could be run in an averaging mode, or an alternating averaging and peak-amplitude-detection mode keyed to the telemetry readout sequence.

------- ISEE 1, HOVESTADT---

INVESTIGATION NAME- LOW-ENERGY COSMIC RAYS

NSSDC ID- 77-102A-05 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - D.K. HOVESTADT MPI-EXTRATERR PHYS
OI - J.J. O'GALLAGHER U OF MARYLAND
OI - M. SCHOLER MPI-EXTRATERR PHYS
OI - L.A. FISK U OF NEW HAMPSHIRE
OI - C.Y. FAN U OF ARIZONA
OI - G. GLOECKLER U OF MARYLAND

BRIEF DESCRIPTION
This instrument, carried on both ISEE 1 and ISEE 3, was designed to measure solar, interplanetary, and magnetospheric energetic ions in numerous bands within the energy range 2 keV/charge to 80 MeV/nucleon, and electrons in four contiguous bands from 75 to 1300 keV. At the lower energies, charge states of heavy ions in the high-speed (> 500 km/s) solar wind were determined. In the range 0.3 to 80 MeV/nucleon, the energy spectra, anisotropies, and composition of energetic ions were determined. In the limited range 0.4 to 6 MeV/nucleon, simultaneous determination of ionic and nuclear charge was possible. The instrument consisted of three different sensor systems. ULECA (ultralow-energy charge analyzer) was an electrostatic analyzer with solid-state detectors. Its energy range was approximately 3 to 560 keV/charge. ULEWAT (ultralow-energy wide-angle telescope) was a double dE/dx vs E, thin-window, flow-through proportional counter/solid-state detector telescope covering the range 0.2 to 80 MeV/nucleon (Fe). ULEZEQ (ultralow-energy Z, E, and Q) was a combination of an electrostatic analyzer and a dE/dx vs E system with a thin-window proportional counter and a position-sensitive solid-state detector. The energy range was 0.4 to 6 MeV/nucleon. Data could be obtained in 45-deg sectors.

------- ISEE 1, MOZER---

INVESTIGATION NAME- QUASI-STATIC ELECTRIC FIELDS

NSSDC ID- 77-102A-06 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - F.S. MOZER U OF CALIF, BERKELEY
OI - M.C. KELLEY CORNELL U

BRIEF DESCRIPTION
The objective of this experiment was to study quasi-static and low-frequency electric fields in the plasmasphere, magnetosphere, magnetosheath, and solar wind. Measurements were made of the potential difference between a pair of 8-cm diameter vitreous carbon spheres which were separated by 73.5 m and mounted on the ends of wire booms in the satellite spin plane. To attempt to overcome the spacecraft sheath (a potential problem which plagues all electric field detectors), an electron gun for changing the spacecraft potential was included, and all exposed spacecraft surfaces were made electrically conducting. The instrument was designed to be sensitive to fields from 0.1 to 200 mV/m in the frequency band of 0 to 12 Hz. The experiment also measured the electric field component of waves at frequencies below 1000 Hz.

------- ISEE 1, OGILVIE---

INVESTIGATION NAME- FAST ELECTRONS

NSSDC ID- 77-102A-02 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL
PI - K.W. OGILVIE NASA-GSFC
OI - J.D. SCUDDER NASA-GSFC

BRIEF DESCRIPTION
This experiment studied the transport coefficients of turbulence in the collisionless plasma represented by the interplanetary medium and magnetosheath, low-energy solar electron events, and bow-shock-associated electrons. Two triaxial systems of 127-deg cylindrical electrostatic analyzers were used to make three-dimensional measurements of the electron distribution function. There were three modes of operation, with the following nominal energy ranges: solar wind, 7 to 500 eV; magnetosheath, 10 eV to 2 keV; and magnetotail and solar, 105 eV to 7.05 keV. The energy resolution (delta E/E) was 0.07. The entire set of six simultaneous spectrometer measurements was taken while the satellite rotated through 60 deg. Each spectrometer consisted of a curved-plate analyzer and two channeltron detectors.

------- ISEE 1, RUSSELL---

INVESTIGATION NAME- FLUXGATE MAGNETOMETER

NSSDC ID- 77-102A-04 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

PERSONNEL
PI - C.T. RUSSELL U OF CALIF, LA
OI - R.L. MCPHERRON U OF CALIF, LA
OI - P.C. HEDGECOCK IMPERIAL COLLEGE
OI - E.W. GREENSTADT TRW SYSTEMS GROUP
OI - M.G. KIVELSON U OF CALIF, LA

BRIEF DESCRIPTION
In this triaxial fluxgate magnetometer, three ring-core sensors in an orthogonal triad were enclosed in a flipper mechanism at the end of the magnetometer boom. The electronics unit was on the main body of the spacecraft at the foot of the boom. The magnetometer had two operating ranges of plus or minus 8192 nT and plus or minus 256 nT in each vector component. The data were digitized and averaged within the instrument to provide increased resolution and to provide Nyquist filtering. There were two modes for the transmission of the averaged data. In the double-precision mode of operation, 16-bit samples of data were transmitted. This provided a maximum resolution of plus or minus 1/4 nT or 1/128 nT in the low-sensitivity and high-sensitivity ranges. In the single-precision mode, any 8 consecutive bits of the above 16 bits were selected by ground command for transmission and the telemetry bandwidths of the magnetometer were doubled. This bandwidth varied from 2 Hz for the low-telemetry-rate, double-precision experiment mode to 32 Hz for the

high-telemetry-rate, single-precision experiment mode.

------- ISEE 1, SHARP--

INVESTIGATION NAME- ION COMPOSITION

NSSDC ID- 77-102A-12

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - R.D.	SHARP	LOCKHEED PALO ALTO
OI - G.	HAERENDEL	MPI-EXTRATERR PHYS
OI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - R.G.	JOHNSON	OF. OF SCI&TECH POLICY
OI - E.G.	SHELLEY	LOCKHEED PALO ALTO
OI - J.	GEISS	U OF BERNE
OI - P.X.	EBERHARDT	U OF BERNE
OI - H.	BALSIGER	U OF BERNE
OI - C.R.	CHAPPELL	NASA-MSFC
OI - A.G.	GHIELMETTI	U OF BERNE
OI - D.T.	YOUNG	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

The objective of this investigation was to determine the ion composition and energy spectra of the plasma within the magnetosphere, magnetosheath, and solar wind, and to determine the angular distribution of the plasma in the magnetosheath. An energetic ion mass spectrometer was flown that had an electrostatic energy analyzer followed by a combined cylindrical electrostatic/magnetic mass analyzer. A combination of electron multipliers was used as the detector. The energy-per-unit-charge range measured was from 0 to 17 keV/Q. The mass-per-unit-charge range measured extended from 1 to 150 u/Q.

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SPACECRAFT COMMON NAME- ISEE 2
ALTERNATE NAMES- IMP-K PRIME, IME-D
10423, ISEE-B
DAUGHTER

NSSDC ID- 77-102B

LAUNCH DATE- 10/22/77 WEIGHT- 165.78 KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

INTERNATIONAL	ESA
UNITED STATES	NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 10/23/77
ORBIT PERIOD- 3454.1 MIN	INCLINATION- 28.7 DEG
PERIAPSIS- 280. KM ALT	APOAPSIS- 138317. KM ALT

PERSONNEL

MG - M.A.	CALABRESE	NASA HEADQUARTERS
SC - M.J.	WISKERCHEN	NASA HEADQUARTERS
PM - A.	HAWKYARD	ESA-ESTEC
PS - A.	PEDERSEN	ESA-ESTEC
PS - A.C.	DURNEY(NLA)	ESA-ESTEC

BRIEF DESCRIPTION

The Explorer-class daughter spacecraft, ISEE 2, was part of the mother/daughter/heliocentric mission (ISEE 1, 2, and 3). The purposes of the mission were (1) to investigate solar-terrestrial relationships at the outermost boundaries of the earth's magnetosphere, (2) to examine in detail the structure of the solar wind near earth and the shock wave that forms the interface between the solar wind and earth, and (3) to continue the investigation of cosmic rays and solar flares in the interplanetary region near 1 AU. The mission thus extended the investigations of previous IMP spacecraft. The mother/daughter portion of the mission consisted of two spacecraft with a station-keeping capability in a highly eccentric earth orbit with apogee of 23 earth radii. The two spacecraft maintained a small separation distance, and made simultaneous coordinated measurements to permit separation of spatial from temporal irregularities in the near-earth solar wind, the bow shock, and inside the magnetosphere. The spin rate of the ISEE 2 spacecraft was fixed at 19.8 rpm, differing slightly from that of the ISEE 1 spacecraft. For instrument descriptions written by the investigators, see IEEE Trans. on Geosci. Electron., v. GE-16, n. 3, July 1978.

------- ISEE 2, ANDERSON--

INVESTIGATION NAME- ELECTRONS AND PROTONS

NSSDC ID- 77-102B-08

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - K.A.	ANDERSON	U OF CALIF, BERKELEY
OI - C.I.	MENG	APPLIED PHYSICS LAB
OI - J.M.	BOSQUED	PAUL SABATIER U
OI - R.	PELLAT	CTR FOR THEORETIC PHYS
OI - F.V.	CORONITI	U OF CALIF, LA
OI - H.	REME	CESR
OI - R.P.	LIN	U OF CALIF, BERKELEY
OI - G.K.	PARKS	U OF WASHINGTON

BRIEF DESCRIPTION

This experiment was designed to determine, by using identical instrumentation on the mother/daughter spacecraft, the spatial extent, propagation velocity, and temporal behavior of a wide variety of particle phenomena. Electrons were measured at 2 and 6 keV and in two bands: 8 to 200 keV and 30 to 200 keV. Protons were measured at 2 and 6 KeV and in three bands: 8 to 200 keV, 30 to 200 keV, and 200 to 380 keV. The 30-keV threshold could be commanded to 15 or 60 keV. Identical instrumentation on each spacecraft consisted of a pair of surface-barrier, semiconductor-detector telescopes (one with a foil and one without a foil) and four fixed-voltage electrostatic analyzers (two for electrons and two for protons). Channel multipliers were used as detectors with the fixed-voltage analyzers. The telescopes had a viewing cone with a 40-deg half-angle, oriented at about 20 deg to the spin axis.

------- ISEE 2, EGIDI--

INVESTIGATION NAME- SOLAR WIND IONS

NSSDC ID- 77-102B-02

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - A.	EGIDI	CNR, SPACE PLASMA LAB
OI - G.	MORENO	CNR, SPACE PLASMA LAB
OI - P.	CERULLI	CNR, SPACE PLASMA LAB
OI - V.	FORMISANO	CNR, SPACE PLASMA LAB
OI - S.C.	CANTARANO	CNR, SPACE PLASMA LAB

BRIEF DESCRIPTION

This instrument was designed to measure the angular distributions and energy spectra of positive ions in the solar wind. The main region of interest was outward from and including the magnetopause (greater than 8 earth radii). Two hemispherical electrostatic analyzers were used to cover the energy range 100 eV to 10 keV/Q in up to 64 energy channels. There were two operating modes: one for high-time resolution and one for high-energy resolution. Energy levels were kept constant through a complete spacecraft revolution.

------- ISEE 2, FRANK--

INVESTIGATION NAME- HOT PLASMA

NSSDC ID- 77-102B-03

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - L.A.	FRANK	U OF IOWA
OI - V.M.	VASYLIUNAS	MPI-AERONOMY
OI - C.F.	KENNEL	U OF CALIF, LA

BRIEF DESCRIPTION

This experiment was designed to study, by means of identical instrumentation on the mother/daughter spacecraft, the spatial and temporal variations of the solar wind and magnetosheath electrons and ions. Protons and electrons in the energy range from 1 eV to 45 keV were measured in 64 contiguous energy bands with an energy resolution (delta E/E) of 0.16. A quadrispherical low-energy proton and electron differential energy analyzer (LEPEDEA), employing seven continuous-channel electron multipliers in each of its two (one for protons and one for electrons) electrostatic analyzers was flown on both the mother and the daughter spacecraft. All but 2% of the 4 pi-sr solid angle was covered for particle-velocity vectors. A GM tube was also included, with a conical field of view of 40-deg full-angle, perpendicular to the spin axis. This detector was sensitive to electrons with E>45 keV, and to protons with E>600 keV.

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------- ISEE 2, GURNETT---

INVESTIGATION NAME- PLASMA WAVES

NSSDC ID- 77-102B-05 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

PERSONNEL

PI - D.A.	GURNETT	U OF IOWA
OI - F.L.	SCARF	TRW SYSTEMS GROUP
OI - E.J.	SMITH	NASA-JPL
OI - R.W.	FREDRICKS	TRW SYSTEMS GROUP

BRIEF DESCRIPTION

In this experiment, a single-axis search coil magnetometer with a high permeability core and two electric field dipoles (30 m tip-to-tip and 0.61 m) measured wave phenomena occurring within the magnetosphere and solar wind in conjunction with a similar experiment (77-102A-07) flown on the mother spacecraft. The antennas were mounted perpendicularly to the spin axis. The instrumentation was composed of two elements: (1) a high-time-resolution spectrum analyzer with 16 frequency channels (identical to those on ISEE 1) from 5.62 Hz to 31.1 kHz where all channels were sampled 1 or 4 times per s, depending on bit rate; and (2) a wide-band receiver to condition electric and magnetic waveforms for transmission to the ground via the special-purpose analog transmitter. There were two basic frequency channels, from 10 Hz to 1 kHz and from 650 Hz to 10 kHz. In addition, the frequency range could be shifted by a frequency-conversion scheme to any of eight ranges up to 2.0 MHz.

------- ISEE 2, HARVEY---

INVESTIGATION NAME- RADIO PROPAGATION

NSSDC ID- 77-102B-06 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI - C.C.	HARVEY	PARIS OBSERVATORY
OI - R.E.	GENDRIN	CNET
OI - J.R.	MCAFEE	NOAA-ERL
OI - M.	PETIT	CNET
OI - D.	JONES	BRITISH ANTARCTIC SURV
OI - J.M.	ETCHETO	CNET
OI - R.J.L.	GRARD	ESA-ESTEC

BRIEF DESCRIPTION

The total electron content between the mother and daughter was obtained by measuring the phase delay introduced by the ambient plasma onto a wave of frequency about 683 kHz, transmitted from the mother (experiment -08) and received on the daughter. The phase was compared against a phase-coherent signal transmitted from the mother to the daughter by modulation onto a carrier of frequency high enough (272.5 MHz) to be unaffected by the ambient plasma.

------- ISEE 2, RUSSELL---

INVESTIGATION NAME- FLUXGATE MAGNETOMETER

NSSDC ID- 77-102B-04 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

PERSONNEL

PI - C.T.	RUSSELL	U OF CALIF, LA
OI - R.L.	MCPHERRON	U OF CALIF, LA
OI - P.C.	HEDGECOCK	IMPERIAL COLLEGE
OI - E.W.	GREENSTADT	TRW SYSTEMS GROUP
OI - M.G.	KIVELSON	U OF CALIF, LA

BRIEF DESCRIPTION

In this triaxial fluxgate magnetometer, three ring-core sensors in an orthogonal triad were enclosed in a flipper mechanism at the end of the magnetometer boom. The electronics unit was on the main body of the spacecraft at the foot of the boom. The magnetometer had two operating ranges of plus or minus 8192 nT and plus or minus 256 nT in each vector component. The data were digitized and averaged within the instrument to provide increased resolution and to provide Nyquist filtering. There were two modes for the transmission of the averaged data. In the double-precision mode of operation, 16-bit samples of data were transmitted. This provided a maximum resolution of plus or minus 1/4 nT or 1/128 nT in the low-sensitivity and high-sensitivity ranges.

------- ISEE 2, WILLIAMS---

INVESTIGATION NAME- ENERGETIC ELECTRONS AND PROTONS

NSSDC ID- 77-102B-07 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - D.J.	WILLIAMS	APPLIED PHYSICS LAB
OI - T.A.	FRITZ	LOS ALAMOS NAT LAB
OI - C.O.	BOSTROM	APPLIED PHYSICS LAB
OI - E.	KEPPLER	MPI-AERONOMY
OI - B.	WILKEN	MPI-AERONOMY
OI - G.H.	WIBBERENZ	U OF KIEL

BRIEF DESCRIPTION

This experiment was designed to identify and to study plasma instabilities responsible for acceleration, source and loss mechanisms, and boundary and interface phenomena throughout the orbital range of the mother/daughter satellites. A proton telescope and an electron spectrometer were flown on each spacecraft to measure detailed energy spectra and angular distributions. These detectors used silicon, surface-barrier, totally depleted, solid-state devices of various thicknesses, areas, and configurations. Protons in 5 directions and 12 energy channels between 20 keV and 2 MeV and electrons in 5 directions and 12 energy channels between 20 keV and 300 keV (to 1.2 MeV for the 90-deg direction) were measured. Data were accumulated in up to 32 sectors per spin.

**************************** ISEE 3****************************

SPACECRAFT COMMON NAME- ISEE 3
ALTERNATE NAMES- STP PROBE, IME-H
HELIOCENTRIC, INTNL SUN EARTH EXPL-C
ISEE-C, ICE
INTNL COMETARY EXPLORER

NSSDC ID- 78-079A

LAUNCH DATE- 08/12/78 WEIGHT- 469. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- SOLAR WIND/GEOTAIL/COMET RENDEZVOUS

PERSONNEL

MG - M.A.	CALABRESE	NASA HEADQUARTERS
SC - M.J.	WISKERCHEN	NASA HEADQUARTERS
PM - J.P.	CORRIGAN	NASA-GSFC
PS - T.T.	VON ROSENVINGE	NASA-GSFC
MO - R.O.	WALES	NASA-GSFC

BRIEF DESCRIPTION

The Explorer-class heliocentric spacecraft, ISEE 3, was part of the mother/daughter/heliocentric mission (ISEE 1, 2, and 3). The purposes of the mission were (1) to investigate solar-terrestrial relationships at the outermost boundaries of the earth's magnetosphere, (2) to examine in detail the structure of the solar wind near the earth and the shock wave that forms the interface between the solar wind and earth, and (3) to continue the investigation of cosmic rays and solar flares in the interplanetary region near 1 AU. The mission thus extended the investigations of previous IMP spacecraft. The launch of three coordinated spacecraft in this mission permitted the separation of spatial and temporal effects. This heliocentric spacecraft had a spin axis normal to the ecliptic plane and a spin rate of about 20 rpm. It was placed into an elliptical halo orbit about the libration point (L1) 235 earth radii on the sun side of the earth, where it continuously monitored changes in the near-earth interplanetary medium. Because both the mother and daughter spacecraft had eccentric geocentric orbits, it was hoped that this mission would measure the cause/effect relationships between the incident solar plasma and the magnetosphere. Finally, the heliocentric spacecraft also provided a near-earth base for making cosmic-ray and other planetary measurements for comparison with coincident measurements from deep-space probes. For instrument descriptions written by the investigators, see IEEE Trans. on Geosci. Electron., v. GE-16, n. 3, July 1978. In 1982 the spacecraft began a magnetotail and comet encounter mission. On August 10, 1982, an orbit change maneuver was conducted to remove the spacecraft from the halo orbit around the L1 point and place it in a transfer orbit to a series of orbits between earth and the L2 (magnetotail) libration point. After several orbits through the earth's magnetotail, with gravity assists from lunar flybys in September and October of 1983, a critical lunar flyby December 22, 1983, threw the spacecraft out of the earth-moon system and into an orbit which leads the earth. At this time, the spacecraft was given a new name, ICE (International Cometary Explorer). The spacecraft will encounter the tail of Comet Giacobini-Zinner on September 11, 1985, and will be between the sun and Comet Halley in late March 1986, when other spacecraft (Giotto, Planet-A, MS-T5, VEGA) will be nearer to Comet Halley on comet rendezvous

missions. Tracking and telemetry support have been provided by the DSN (Deep Space Network) since January 1984.

------- ISEE 3, ANDERSON--

INVESTIGATION NAME- X- AND GAMMA-RAY BURSTS

NSSDC ID- 78-079A-14 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY
GAMMA-RAY ASTRONOMY
SOLAR PHYSICS

PERSONNEL

PI - K.A.	ANDERSON	U OF CALIF, BERKELEY
OI - S.R.	KANE	U OF CALIF, BERKELEY
OI - W.D.	EVANS	LOS ALAMOS NAT LAB
OI - R.W.	KLEBESADEL	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
This experiment was designed to provide continuous coverage of solar-flare X rays and transient cosmic gamma-ray bursts. Detectors were a xenon-filled proportional counter (5-14 keV in 6 channels) and a NaI scintillator (12-1250 keV in 12 channels). There were four operating modes: normal, flare-1, flare-2, and gamma-burst. In the normal mode, the time resolution was 0.5 to 4 s, depending on the channel. In the gamma-burst mode, the best time resolution was 0.25 to 125 ms and used stored data.

------- ISEE 3, BAME--

INVESTIGATION NAME- SOLAR WIND PLASMA

NSSDC ID- 78-079A-01 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS

PERSONNEL

PI - S.J.	BAME	LOS ALAMOS NAT LAB
OI - J.R.	ASBRIDGE	LOS ALAMOS NAT LAB
OI - E.W.	HONES, JR.	LOS ALAMOS NAT LAB
OI - M.D.	MONTGOMERY	LOS ALAMOS NAT LAB
OI - W.C.	FELDMAN	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
This experiment was designed to make an integrated study of the nature, origin, and evolution of structure in the interplanetary medium. Also, the thermal state of the interplanetary plasma was studied, unperturbed by the earth's bow shock. Ion velocity distributions were measured by a 135-deg spherical electrostatic analyzer in both two and three dimensions. Step energy resolution for each energy window was 4.2%. Electron velocity distributions were measured by a 90-deg spherical electrostatic analyzer, also in two and three dimensions. The energy window per step for electrons was 10%. Channeltron electron multipliers were used as detectors for each of the analyzers. Solar wind electrons were measured in 15 contiguous channels from 8.5 to 1140 eV. A special photoelectron range of 1.6 to 220 eV could be commanded. Various mixtures of data for two-dimensional and three-dimensional distribution functions could be selected. Ions were measured in 32 channels from 237 eV per charge to 10.7 keV per charge. Various modes were available for basic sweep, search, and tracking of the peak of the distribution.

------- ISEE 3, HOVESTADT--

INVESTIGATION NAME- LOW-ENERGY COSMIC RAYS

NSSDC ID- 78-079A-03 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - D.K.	HOVESTADT	MPI-EXTRATERR PHYS
OI - J.J.	O'GALLAGHER	U OF MARYLAND
OI - C.Y.	FAN	U OF ARIZONA
OI - G.	GLOECKLER	U OF MARYLAND
OI - M.	SCHOLER	MPI-EXTRATERR PHYS
OI - L.A.	FISK	U OF NEW HAMPSHIRE

BRIEF DESCRIPTION
This instrument, designated HOH, carried on ISEE 1 and ISEE 3, was designed to measure solar, interplanetary, and magnetospheric energetic ions in numerous bands within the energy range 2 keV/charge to 80 MeV/nucleon, and electrons in four contiguous bands from 75 to 1300 keV. At the lower energies, charge states of heavy ions in the high-speed (>500 km/s) solar wind were determined. In the range 0.3 to 80 MeV/nucleon, the energy spectra, anisotropies, and composition of energetic ions were determined. In the limited range 0.4 to 6 MeV/nucleon, simultaneous determination of ionic and nuclear charge was possible. The instrument consisted of three different sensor systems. ULECA (ultralow-energy charge analyzer) was an electrostatic analyzer with solid-state detectors. Its energy range was approximately 3 to 560 keV/charge. ULEWAT (ultralow-energy wide-angle telescope) was a dE/dx vs E, thin-window, flow-through proportional counter/solid-state detector telescope covering the range 0.2 to 80 MeV/nucleon (Fe). ULEZEQ (ultralow-energy Z, E, and Q) was a combination of an electrostatic analyzer and a dE/dx versus E system with a thin-window proportional counter and a position-sensitive solid-state detector. The energy range was 0.4 to 6 MeV/nucleon. Data could be obtained in 45-deg sectors.

------- ISEE 3, HYNDS--

INVESTIGATION NAME- ENERGETIC PROTONS

NSSDC ID- 78-079A-08 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS
INTERPLANETARY PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - R.J.	HYNDS	IMPERIAL COLLEGE
OI - J.J.	VAN ROOIJEN	U OF UTRECHT
OI - J.N.	VAN GILS	U OF UTRECHT
OI - R.M.	VAN DEN NIEUWENHOF	U OF UTRECHT
OI - K.P.	WENZEL	ESA-ESTEC
OI - T.R.	SANDERSON	ESA-ESTEC
OI - V.	DOMINGO	ESA-ESTEC
OI - D.E.	PAGE	ESA-ESTEC
OI - A.	BALOGH	IMPERIAL COLLEGE
OI - C.	DE JAGER	U OF UTRECHT
OI - H.	ELLIOT	IMPERIAL COLLEGE

BRIEF DESCRIPTION
This experiment, designated DFH, was designed to study low-energy solar proton acceleration and propagation processes in interplanetary space. The instrument measured the energy spectrum in 8 channels, and the 3-dimensional angular distribution of protons in the energy range 0.035 to 1.6 MeV with a basic time resolution of 16 s. Counts of each channel were grouped into eight 45-deg sectors. The instrument consisted of three identical telescopes mounted at 30, 60, and 135 deg relative to the spacecraft spin axis, each containing two surface-barrier detectors, a mechanical collimator, and a "broom" magnet to sweep away electrons.

------- ISEE 3, MEYER--

INVESTIGATION NAME- COSMIC-RAY ELECTRONS AND NUCLEI

NSSDC ID- 78-079A-06 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - P.	MEYER	U OF CHICAGO
OI - P.	EVENSON	U OF CHICAGO

BRIEF DESCRIPTION
This experiment was designed to study particle propagation within the solar system and the properties of the interplanetary medium. The following species were resolved: (1) electrons (differential spectrum from 5 to 400 MeV); (2) nuclei from protons to the iron group (differential spectra and relative abundances from 30 to 15,000 MeV/nucleon); and (3) helium through sulfur. A charged-particle telescope was used to make these measurements. It consisted of three solid-state detectors, a gas Cerenkov counter, a CsI scintillation detector, two plastic scintillation counters, and a quartz Cerenkov counter. The design of the telescope was based on that used in experiment 68-014A-09 for OGO 5.

------- ISEE 3, OGILVIE--

INVESTIGATION NAME- SOLAR WIND ION COMPOSITION

NSSDC ID- 78-079A-11 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS

PERSONNEL

PI - K.W.	OGILVIE	NASA-GSFC
OI - J.	GEISS	U OF BERNE
OI - M.H.	ACUNA	NASA-GSFC
OI - M.A.	COPLAN	U OF MARYLAND
OI - D.L.	LIND	NASA-JSC

BRIEF DESCRIPTION
This experiment consisted of a hemispherical electrostatic energy analyzer and a Wien velocity filter configured as a mass spectrometer to determine the charge state and isotopic constitution of the solar wind. The instrument had an energy-per-unit-charge range of 0.84 to 11.7 keV per charge, a mass-per-unit-charge range of 1.5 to 5.6 u per charge, and a velocity range of 300 to 600 km/s.

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------- ISEE 3, SCARF -------

INVESTIGATION NAME- PLASMA WAVES

NSSDC ID- 78-079A-07

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - F.L.	SCARF	TRW SYSTEMS GROUP
OI - D.A.	GURNETT	U OF IOWA
OI - E.J.	SMITH	NASA-JPL
OI - R.W.	FREDRICKS	TRW SYSTEMS GROUP

BRIEF DESCRIPTION

This experiment was designed to provide data for plasma-wave studies undertaken to gain a better understanding of the wave-particle interaction and plasma instabilities, which lead to the equivalent collision phenomena that produce apparent fluid-like behavior in the solar wind near 1 AU. Two electric dipoles and a boom-mounted magnetic search coil were used to measure magnetic and electric field wave levels from 17 Hz to 1 kHz in 8 channels and electric field levels from 17 Hz to 100 kHz in 16 channels. In addition, a third spectrum analyzer with three bands between 0.316 and 8.8 Hz was included for measurement of the magnetic field. This unit used the search coil, but was located within the electronics unit of experiment 78-079A-02.

------- ISEE 3, SMITH -------

INVESTIGATION NAME- MAGNETIC FIELDS

NSSDC ID- 78-079A-02

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - E.J.	SMITH	NASA-JPL
OI - L.	DAVIS, JR.	CALIF INST OF TECH
OI - G.L.	SISCOE	U OF CALIF, LA
OI - D.E.	JONES	BRIGHAM YOUNG U
OI - B.T.	TSURUTANI	NASA-JPL

BRIEF DESCRIPTION

The instrumentation for this experiment consisted of a boom-mounted triaxial vector helium magnetometer. Measurements were made of the steady magnetic field and its low-frequency variations. Eight field amplitude ranges (minus to plus 4, 14, 42, 144, 640, 4000, 22,000, and 140,000 nT) were available. The instrument ranged up and down automatically or could be commanded into a specific range. The field equivalent noise power spectral density was 2E-4 nT squared per Hz (independent of frequency), or 0.01 nT rms in the passband 0 to 0.5 Hz. A single-axis spectrum analyzer measured fluctuations parallel to the spacecraft spin axis in three frequency bands centered at 0.33, 3.2, and 8.8 Hz.

------- ISEE 3, STEINBERG -------

INVESTIGATION NAME- RADIO MAPPING

NSSDC ID- 78-079A-10

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
RADIO PHYSICS
SOLAR PHYSICS

PERSONNEL

PI - J.L.	STEINBERG	PARIS OBSERVATORY
OI - P.	COUTURIER	PARIS OBSERVATORY
OI - R.	KNOLL	PARIS OBSERVATORY
OI - J.	FAINBERG	NASA-GSFC
OI - R.G.	STONE	NASA-GSFC
OI - S.R.	MOSIER	NATL SCIENCE FOUND

BRIEF DESCRIPTION

This experiment was designed to measure the direction (two angles) of type-III solar bursts at 24 frequencies stepped from 30 kHz to 2 MHz. Relying on solar rotation, one could obtain a three-dimensional map of the magnetic lines of force which guide the electrons that produce type-III solar bursts. These results could be determined from 10 solar radii to 1 AU, in or out of the ecliptic. The instrument consisted primarily of two dipole antennas and a four-channel radiometer, with bandwidths of 3 kHz and 10 kHz. The frequency sequence had 72 steps and required 108 s. Self-calibration occurred every 18 h.

------- ISEE 3, STONE -------

INVESTIGATION NAME- HIGH-ENERGY COSMIC RAYS

NSSDC ID- 78-079A-12

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - E.C.	STONE	CALIF INST OF TECH
OI - R.E.	VOGT	CALIF INST OF TECH

BRIEF DESCRIPTION

This experiment was designed to study the isotopic constitution of solar matter and galactic cosmic-ray sources, the processes of nucleosynthesis in the sun and in the galaxy, and astrophysical particle acceleration processes. The following species were resolved: lithium through nickel (Z from 3 through 28 and A from 6 through 64) in the energy range from 5 to 250 MeV/nucleon. The mass resolution was <0.3 u for Z<30.

------- ISEE 3, TEEGARDEN -------

INVESTIGATION NAME- GAMMA-RAY BURSTS

NSSDC ID- 78-079A-15

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - B.J.	TEEGARDEN	NASA-GSFC
OI - D.K.	HOVESTADT	MPI-EXTRATERR PHYS
OI - T.L.	CLINE	NASA-GSFC
OI - G.	GLOECKLER	U OF MARYLAND

BRIEF DESCRIPTION

This experiment was designed to recognize and record the time history of gamma-ray bursts, and to provide high-resolution spectra of gamma-ray burst photons between 0.05 and 6.5 MeV. Three detectors were used. Detector 1 was a 4-cm diameter by 3-cm-thick germanium crystal, radiatively cooled to operate at approximately 101 deg K. The energy range was between 0.12 and 6.5 MeV, and the energy resolution was <3.5 keV at 1 MeV. A 4096-channel A/D converter digitized the signals for input to the gamma-burst digital instrumentation, which was in the low-energy cosmic-ray experiment, 78-079A-03. Detector 2 consisted of the CsI and surrounding detectors in the cosmic-ray electrons and nuclei experiment, 78-079A-06. Both temporal and spectral information were obtained from this detector. This detector was felt to be somewhat noisy. Detector 3 consisted of the smaller CsI crystal in experiment 78-079A-03. Its energy range began at about 79 keV. Two time-history memories of 2000 12-bit words were used, and received information from any of the three detectors by command. The stored values were time intervals over which a fixed number (1-128) of counts was accumulated. The time-interval clock frequency was selectable from 1 to 8 kHz. Spectral information from either detector 1 or 2 was stored in a third memory of 3072 16-bit words. Twelve bits were used for pulse-height data and four bits for time. The counting rate input to the time history memories caused a trigger signal to occur if the rate exceeded a commandable value. When this occurred, all three memories were allowed to fill. These memories could be read out at a very low bit rate, either automatically or by command.

------- ISEE 3, VON ROSENVINGE -------

INVESTIGATION NAME- MEDIUM ENERGY COSMIC RAY

NSSDC ID- 78-079A-04

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - T.T.	VON ROSENVINGE	NASA-GSFC
OI - L.A.	FISK	U OF NEW HAMPSHIRE
OI - F.B.	MCDONALD	NASA HEADQUARTERS
OI - J.H.	TRAINOR	NASA-GSFC
OI - M.A.I.	VAN HOLLEBEKE	U OF MARYLAND

BRIEF DESCRIPTION

This experiment was designed to study the composition of solar cosmic rays from hydrogen through iron and the elemental abundance of galactic cosmic rays. Three cosmic-ray telescopes, plus a proportional counter for measurement of electrons and X rays, comprised the instrumentation. Nuclei with Z between 1 and 30 were measured in various energy windows in the range 1 to 500 MeV/nucleon. Unit mass resolution was obtained for isotopes with Z equal to 1, 2, and 3 to 7 in the energy ranges 4 to 70, 1 to 70, and 30 to 140 MeV/nucleon, respectively. Electrons were measured in the energy range approximately 2 to 10 MeV. Anisotropy information was obtained for the electrons and nuclei with Z equal to 1 to 26.

------- ISEE 3, WIEDENBECK ---------------------------------------

INVESTIGATION NAME- HIGH-ENERGY COSMIC RAY

NSSDC ID- 78-079A-05 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - M.E. WIEDENBECK U OF CHICAGO
OI - D.E. GREINER U OF CALIF, BERKELEY

BRIEF DESCRIPTION
This experiment was designed to determine the isotopic abundance in the primary cosmic rays for hydrogen through nickel. The instrument used a 10-element solid-state particle telescope consisting of lithium-drifted silicon detectors. Energy ranges measured ran from approximately 20 to approximately 500 MeV/nucleon. The direction of incident nuclei was obtained from a six-plane drift chamber with 2-deg resolution.

------- ISEE 3, WILCOX ---------------------------------------

INVESTIGATION NAME- GROUND BASED SOLAR STUDIES

NSSDC ID- 78-079A-13 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
INTERPLANETARY MAGNETIC FIELDS

PERSONNEL
PI - J.M. WILCOX(DECEASED) STANFORD U

BRIEF DESCRIPTION
This experiment consisted of the measurement of large-scale solar magnetic and velocity fields with the Stanford ground-based solar telescope, and the comparison of these measurements with measurements of the interplanetary magnetic field and solar wind made by other experiments on this spacecraft. The purpose of the experiment was to study the large-scale structure of the solar magnetic field and its extension into interplanetary space by the solar wind.

**************************** ISIS 1 ****************************

SPACECRAFT COMMON NAME- ISIS 1
ALTERNATE NAMES- ISIS-A, 03669

NSSDC ID- 69-009A

LAUNCH DATE- 01/30/69 WEIGHT- 241. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

CANADA	DRB-DRTE
UNITED STATES	NASA-OSSA
JAPAN	RRL

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 02/04/69
ORBIT PERIOD- 128.42 MIN INCLINATION- 88.42 DEG
PERIAPSIS- 578. KM ALT APOAPSIS- 3526. KM ALT

PERSONNEL

MG - M.B.	WEINREB(FORMER)	NASA HEADQUARTERS
MG - C.A.	FRANKLIN(FORMER)	DOC-CRC
SC - E.R.	SCHMERLING(FORMER)	NASA HEADQUARTERS
SC - T.R.	HARTZ(RETIRED)	DOC-CRC
PM - L.H.	BRACE(FORMER)	NASA-GSFC
PS - L.H.	BRACE(FORMER)	NASA-GSFC

BRIEF DESCRIPTION
ISIS 1 was an ionospheric observatory instrumented with sweep- and fixed-frequency ionosondes, a VLF receiver, energetic and soft particle detectors, an ion mass spectrometer, an electrostatic probe, an electrostatic analyzer, a beacon transmitter, and a cosmic noise experiment. The sounder used two dipole antennas (73 and 18.7 m long). The satellite was spin-stabilized at about 2.9 rpm after antenna deployment. Some control was exercised over the spin rate and attitude by using magnetically induced torques to change the spin rate and to precess the spin axis. A tape recorder with 1-h capacity was included on the satellite. The satellite could be programmed to take recorded observations for four different time periods for each full recording period. The recorder data were dumped only at Ottawa. For non-tape-recorded observations, data for the satellite and subsatellite regions could be acquired and telemetered when the spacecraft was in the line of sight of telemetry stations. The selected telemetry stations were in areas that provided primary data coverage near the 80-deg-W meridian and in areas near Hawaii, Si pore, Australia, England, Norway, India, Japan, Antar ica, ew Zealand, and Central Africa. NASA support of the ISIS project was terminated on October 1, 1979. A significant amount of experimental data, however, was acquired aft this date by the Canadian project team. ISIS 1 ope ions were terminated in Canada on March 9, 1984. The Radio Research Laboratories (Tokyo, Japan) then requested and received permission to reactivate ISIS 1. Regular ISIS 1 operations were started from Kashima, Japan, in early August 1984.

------- ISIS 1, BARRINGTON ---------------------------------------

INVESTIGATION NAME- VLF RECEIVER

NSSDC ID- 69-009A-03 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - R.E.	BARRINGTON(FORMER)	DOC-CRC
OI - F.H.	PALMER(FORMER)	DEFENCE RESEARCH ESTAB
OI - H.G.	JAMES(FORMER)	DOC-CRC

BRIEF DESCRIPTION
The purpose of this experiment was to study natural and man-made VLF signals. Specific objectives included the investigation of VLF propagation phenomena, ion and hybrid plasma resonances, and correlations between VLF emissions and intense fluxes of energetic particles. In this experiment an attempt was made to stimulate the ion resonances of the ambient plasma by using signals from a VLF sweep-frequency exciter, contained within the spacecraft. The instrumentation consisted of a low-frequency, broadband receiver that sensed signals received by the 73-m dipole (split monopole) antenna, between 0.05 and 30 kHz. This same antenna was used for receiving frequencies below 5 MHz on the ionosonde. The receiver had a wide dynamic range (80 dB) that was achieved by use of an automatic gain control system. This VLF experiment included an optional-use onboard exciter that operated over a frequency cycle pattern of 0 to 0.3 to 0 to 11 to 0 kHz over a 3.5-s "frame" period. The frames sequenced through four steps where the transmissions were attenuated by 0, 20, 20, then 40 dB, thus requiring 14 s for one complete cycle of exciter operation. The exciter transmitted on the short antennas and the receiver sensed the signals coupled between the two antennas by the ambient plasma, plus any noise signals which were excited in the plasma. This VLF experiment also permitted antenna impedance measurements, with or without a dc bias on the antenna. The real-time data were transmitted on 136.08-MHz telemetry. The VLF data could be recorded on one of the four tape-recorder channels during the time the tape recorder operated. Tape-recorded and backup real-time data were transmitted on 400-MHz telemetry.

------- ISIS 1, BRACE ---------------------------------------

INVESTIGATION NAME- CYLINDRICAL ELECTROSTATIC PROBES

NSSDC ID- 69-009A-07 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
AERONOMY

PERSONNEL
PI - L.H. BRACE(FORMER) NASA-GSFC
OI - J.A. FINDLAY(FORMER) NASA-GSFC

BRIEF DESCRIPTION
The purpose of this experiment was to study the global variations of electron temperature and electron concentration at S/C altitudes during solar maximum, and to study characteristics of the S/C ion sheath. The measurements were made with two cylindrical probes, operating as Langmuir probes. There were a boom probe and an axial probe. The axial probe extended 48.3 cm from the S/C, along the spin axis, and was centered among the four telemetry antennas on the underside of the S/C. This probe was capable of measurements undisturbed by the satellite motion only when the probe preceded the S/C in its motion through the plasma. The boom probe extended horizontally and outward (in S/C frame of reference) from a boom 1 m long, which in turn extended from an upper surface of the S/C at an angle of about 45 deg to the spin axis. This probe provided some observations during each S/C spin cycle that were free of S/C wake effects. The probes consisted of three concentric, electrically isolated, stainless steel tubes. The outer (0.24-cm diam and 23-cm long) tube floated at its own equilibrium potential and served to place the collector well away from the S/C plasma sheath. The middle tube (0.165-cm diam) extending 23 cm outward from the outer tube acted as an electrical guard for the collector. Its electrical potential was controlled. The collector (0.058-cm diam) extended 23 cm outward from the driven guard. During each 2-min sequence, a volt-ampere curve was obtained from the sawtooth voltage (-2 to +10 V) applied to the collector. This was interpreted in electron densities over a range from 1.E2 to 1.5E6 electrons per cc, and temperatures from about 400 to 5.E4 deg K. NSSDC has all the useful data that exist from this investigation.

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------- ISIS 1, CALVERT--

INVESTIGATION NAME- FIXED-FREQUENCY SOUNDER

NSSDC ID- 69-009A-02 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - W.	CALVERT(FORMER)	U OF IOWA
OI - R.B.	NORTON(FORMER)	NOAA-ERL
OI - J.M.	WARNOCK(FORMER)	NOAA
OI - J.H.	WHITTEKER(FORMER)	DOC-CRC

BRIEF DESCRIPTION
This experiment was designed to study ionospheric features of a smaller scale than could be detected by the sweep sounder, and to study plasma resonances. Parameters measured were virtual range (a function of propagation time of the reflected pulse) and time. These data were normally observed only when the spacecraft was in range of a telemetry station. The fixed-frequency sounder operated from the same antenna, transmitter, and receiver used for the sweep-frequency experiment. It normally operated for 5 s during the frequency flyback period of the sweep-frequency operation that was every 19 or 29 s. One of six frequencies (0.25, 0.48, 1.00, 1.95, 4.00, or 9.303 MHz) was chosen for use by the experimenter as desired. Other modes of operation were available, including continuous observation at a selected frequency, and a special mixed mode with transmission at the fixed frequency of 0.82 MHz and sweep reception.

------- ISIS 1, HARTZ--

INVESTIGATION NAME- COSMIC RADIO NOISE

NSSDC ID- 69-009A-10 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - T.R.	HARTZ(RETIRED)	DOC-CRC
PI - H.G.	JAMES(FORMER)	DOC-CRC

BRIEF DESCRIPTION
This experiment used the sweep-frequency ionosonde receiver automatic gain control voltage to measure galactic and solar radio noise levels. The receiver swept from 0.1 to 20 MHz. The dynamic range was 50 dB, and the bandwidth was 55 kHz. The antennas used were 18.7-m and 73-m dipoles.

------- ISIS 1, MCDIARMID--

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTORS

NSSDC ID- 69-009A-04 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - I.B.	MCDIARMID(FORMER)	NATL RES COUNC OF CAN
OI - J.R.	BURROWS(FORMER)	NATL RES COUNC OF CAN
OI - R.C.	ROSE(RETIRED)	NATL RES COUNC OF CAN

BRIEF DESCRIPTION
The purpose of this experiment was to provide data that would aid in understanding (1) the mechanisms responsible for the production and control of the outer radiation zone, (2) the related problems of particle entry into the earth's magnetic field, and (3) interactions between the earth's magnetosphere and the solar wind. This experiment consisted of four sets of detectors. The first set, comprising four Geiger counters, measured electrons greater than 20 and 40 keV and protons greater than 300 and 500 keV parallel and perpendicular to the satellite spin axis. All remaining detectors measured particles perpendicular to the spin axis. The second set consisted of solid-state, silicon-junction detectors. These responded to electrons greater than 25 and 140 keV, electrons in the range 200 to 770 keV, and protons greater than 200 and 400 keV. The third set consisted of five silicon-junction detectors that responded to protons between 0.15 and 30 MeV. The fourth set consisted of cesium iodide scintillation photomultiplier systems. Each system operated in two modes and responded to electrons greater than 8, 40, and 60 keV and protons greater than 50 keV and in the range 50 to 70 keV.

------- ISIS 1, NELMS--

INVESTIGATION NAME- SWEEP-FREQUENCY SOUNDER

NSSDC ID- 69-009A-01 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - G.L.	NELMS(FORMER)	DOC-CRC
PI - D.B.	MULDREW(FORMER)	DOC-CRC
OI - J.E.	JACKSON(FORMER)	NASA-GSFC
OI - J.H.	WHITTEKER(FORMER)	DOC-CRC
OI - J.	TURNER(FORMER)	IONOSPHERIC PRED SERV
OI - M.	SYLVAIN(FORMER)	LGE
OI - O.	HOLT(FORMER)	AURORAL OBS
OI - Y.	OGATA(FORMER)	RADIO RESEARCH LAB
OI - R.	RAGHAVARAO(FORMER)	PHYSICAL RESEARCH LAB
OI - R.B.	NORTON(FORMER)	NOAA-ERL
OI - K.L.	CHAN(FORMER)	NASA-ARC
OI - R.S.	UNWIN(FORMER)	DEPT OF SCI+INDUST RES

BRIEF DESCRIPTION
The purpose of this experiment was to investigate the ionospheric electron density in the altitude range 300 to 3500 km for a full solar cycle (by combining the ISIS 1 measurements with the Alouette 2 data). Another important function of the sounder was to provide correlative data for the other ISIS 1 experiments, particularly those measuring ionospheric parameters. The ISIS 1 ionosonde was basically a radio transmitter/receiver that recorded the time delay between a transmitted and a returned radio frequency pulse. A continuum of frequencies between 0.1 and 20 MHz was sampled once every 19 or 29 s, and one of six selected frequencies was also used for a period of 3 to 5 s during this 19- or 29-s period. In addition to the sweep- and fixed-frequency modes of operation, a mixed mode was possible where the transmitter frequency was fixed at 0.82 MHz while the receiver swept. Several virtual-height (delay-time) traces were normally observed due to ground reflections, plasma resonances, birefringence of the ionosphere, nonvertical propagation, etc. Virtual height at a given frequency was primarily a function of distance traversed by the signal, electron density along the propagation path, and mode of propagation. The standard data format was an ionogram showing virtual height as a function of frequency.

------- ISIS 1, SAGALYN--

INVESTIGATION NAME- SPHERICAL ELECTROSTATIC ANALYZER

NSSDC ID- 69-009A-08 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
AERONOMY

PERSONNEL

PI - R.C.	SAGALYN(FORMER)	USAF GEOPHYS LAB
OI - M.	SMIDDY(FORMER)	USAF GEOPHYS LAB

BRIEF DESCRIPTION
The objective of the spherical electrostatic analyzer experiment was to measure the temporal and spatial variations in the concentration and energy distribution of the charged particles throughout the orbit. Specifically, the objectives were to measure the following parameters: (1) the density of positive ions having thermal energy in the concentration range from 1.E1 to 1.E6 ions per cc, (2) the kinetic temperature of the thermal ions in the range from 700 to 4000 deg K, (3) the flux and energy spectrum of protons in the range from 0 to 2 keV, and (4) the satellite potential with respect to the undisturbed plasma. Two units made up the experiment package: a 96-cm boom that supported the sensor and made possible omnidirectional measurements, and an electronics package (considered to include the sensor) to perform the measurements and to process the data into a suitable form for telemetry. The sensor was made up of three concentric spherical meshed grids having radii of 3.18, 2.54, and 1.90 cm. The innermost grid was the collector. These grids were made from tungsten mesh and had a transparency of 80 to 90%. To measure the parameters listed above, suitable sweep and step voltages were applied to the grids. This instrument was operated in several modes. The ion densities were sampled 60 times a second, corresponding to a spatial resolution of 150 m. Once per minute the ratio of mass to temperature was sampled, and the energy distribution was sampled once every 2 min. NSSDC has all the useful data that exist from this investigation.

****************************** ISIS 2 ******************************

SPACECRAFT COMMON NAME- ISIS 2
ALTERNATE NAMES- ISIS-B, PL-701F
05104

NSSDC ID- 71-024A

LAUNCH DATE- 04/01/71 WEIGHT- 256. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

CANADA	DOC-CRC
UNITED STATES	NASA-OSSA
JAPAN	RRL

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 04/02/71
ORBIT PERIOD- 113.6 MIN	INCLINATION- 88.1 DEG
PERIAPSIS- 1358. KM ALT	APOAPSIS- 1428. KM ALT

PERSONNEL

MG - M.B. WEINREB(FORMER)	NASA HEADQUARTERS
SC - E.R. SCHMERLING(FORMER)	NASA HEADQUARTERS
SC - T.R. HARTZ(RETIRED)	DOC-CRC
PM - L.H. BRACE(FORMER)	NASA-GSFC
PS - L.H. BRACE(FORMER)	NASA-GSFC

BRIEF DESCRIPTION

ISIS 2 was an ionospheric observatory instrumented with a sweep- and a fixed-frequency ionosonde, a VLF receiver, energetic and soft particle detectors, an ion mass spectrometer, an electrostatic probe, a retarding potential analyzer, a beacon transmitter, a cosmic noise experiment, and two photometers. Two long crossed-dipole antennas (73 and 18.7 m) were used for the sounding, VLF, and cosmic noise experiments. The spacecraft was spin-stabilized to about 2 rpm after antenna deployment. There were two basic orientation modes for the spacecraft, cartwheel and orbit-aligned. The spacecraft operated approximately the same length of time in each mode, remaining in one mode typically 3 to 5 months. The cartwheel mode with the axis perpendicular to the orbit plane was made available to provide ram and wake data for some experiments for each spin period, rather than for each orbit period. Attitude and spin information was obtained from a three-axis magnetometer and a sun sensor. Control of attitude and spin was possible by means of magnetic torquing. The experiment package also included a programmable tape recorder with a 1-h capacity. For nonrecorded observations, data from satellite and subsatellite regions were telemetered when the spacecraft was in the line of sight of a telemetry station. Telemetry stations were located so that primary data coverage was near the 80-deg-W meridian and near Hawaii, Singapore, Australia, England, France, Norway, India, Japan, Antarctica, New Zealand, and Central Africa. NASA support of the ISIS project was terminated on October 1, 1979. A significant amount of experimental data, however, was acquired after this date by the Canadian project team. ISIS 2 operations were terminated in Canada on March 9, 1984. The Radio Research Laboratories (Tokyo, Japan) then requested and received permission to reactivate ISIS 2. Regular ISIS 2 operations were started from Kashima, Japan, in early August 1984.

------- ISIS 2, ANGER---

INVESTIGATION NAME- 3914- AND 5577-A PHOTOMETER

NSSDC ID- 71-024A-11 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS
AERONOMY

PERSONNEL

PI - C.D. ANGER(FORMER)	U OF CALGARY

BRIEF DESCRIPTION

This dual-wavelength scanning auroral photometer was designed to map the distribution of auroral emissions at 5577 and 3914 A over the portion of the dark earth visible to the spacecraft. A combination of internal electronic scanning performed by an image dissector and of the natural orbital and rotational motions of the spacecraft permitted the sensor to systematically scan across the earth. The detector system was constructed to allow incident radiation to be accepted from two directions 180 deg apart, and then to focus this light at a common point on the single-image-dissector photometer tube. Only one of the two optical systems pointed at the earth at any one time, while the other faced into space. When the spacecraft spin axis was oriented to lie in the orbital plane, each rotation of the spacecraft resulted in an earth scan 5 deg wide. This width size was chosen to ensure overlap with the previous scan. The image dissector repetitively scanned at a high speed across the narrow dimension of each 5-deg band and divided it into separately resolved regions 0.4 deg by 0.4 deg. Similar strips were scanned at each of the two wavelengths, but at times which differed by half the rotation period of about 10 s. A calibration light source for each wavelength was built into the optical assembly, and a calibration cycle was initiated automatically whenever a "power on" command was given. To minimize the problems arising from solar illumination of the optics and the direct viewing of the sunlit earth, a sunlight protection system was included. Complete details about the experiment can be found in C. D. Anger et al., "The ISIS-II scanning auroral photometer," Applied Optics, v. 12, n. 8, pp. 1753-1766, August 1973.

------- ISIS 2, BARRINGTON---

INVESTIGATION NAME- VLF RECEIVER

NSSDC ID- 71-024A-03 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - R.E. BARRINGTON(FORMER)	DOC-CRC
OI - F.H. PALMER(FORMER)	DEFENCE RESEARCH ESTAB
OI - H.G. JAMES(FORMER)	DOC-CRC

BRIEF DESCRIPTION

The purpose of this experiment was to study natural and man-made VLF signals. Specific objectives included the investigation of VLF propagation phenomena, ion and hybrid plasma resonances, and correlations between VLF emissions and intense fluxes of energetic particles. In this experiment a sweep-frequency exciter, covering the range from 15 kHz down to 0.05 kHz in 1.0 s, was used to stimulate ion resonances in the plasma. The instrumentation consisted of a low-frequency broadband receiver that observed signals from the 73-m long dipole (split monopole) antenna between 0.05 and 30 kHz. This same antenna was used for receiving signals below 5 MHz on the ionosonde. The VLF receiver had a wide dynamic range that was achieved by use of an automatic gain control system. The experiment also permitted antenna impedance measurements, with or without a dc bias on the antenna. The real-time data were transmitted on 136.08-MHz telemetry. The VLF data could be recorded on one of the four tape-recorder channels when the spacecraft tape-recorder was operating. Tape-recorded and backup real-time data were transmitted on 400-MHz telemetry.

------- ISIS 2, BRACE---

INVESTIGATION NAME- CYLINDRICAL ELECTROSTATIC PROBES

NSSDC ID- 71-024A-07 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
AERONOMY

PERSONNEL

PI - L.H. BRACE(FORMER)	NASA-GSFC
OI - J.A. FINDLAY(FORMER)	NASA-GSFC

BRIEF DESCRIPTION

The purpose of this experiment was to study the global variations of electron temperature and electron concentration at spacecraft altitudes during the waning phase of the solar cycle. The measurements were made with two cylindrical probes mounted along the spin axis, one at each end of the spacecraft. The sensors were operated as Langmuir probes, with the probe current being measured as a function of probe voltage. Although basically the same cylindrical probe experiment was flown on ISIS 1, the ISIS 2 probe provided (1) greater sensitivity allowing a more complete coverage of low-density regions such as the region over the polar cap, (2) very high resolution of plasma structure (down to 10 m in extent), and (3) onboard signal processing with backup to provide data in the format that had been used for the ISIS 1 experiment. NSSDC has all the useful data that exist from this investigation.

------- ISIS 2, CALVERT---

INVESTIGATION NAME- FIXED-FREQUENCY SOUNDER

NSSDC ID- 71-024A-02 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - W. CALVERT(FORMER)	U OF IOWA
OI - R.B. NORTON(FORMER)	NOAA-ERL
OI - J.H. WHITTEKER(FORMER)	DOC-CRC
OI - J.M. WARNOCK(FORMER)	NOAA

BRIEF DESCRIPTION

This experiment was designed to study ionospheric features of a smaller scale than could be detected by the sweep sounder and to study plasma resonances. Parameters measured were virtual range (a function of propagation time of the pulse) and time. These data were normally observed only when the spacecraft was in range of a telemetry station. The fixed-frequency sounder operated from the same antenna, transmitter, and receiver used for the sweep-frequency experiment. It normally operated for 3 to 5 s during the frequency flyback period of the sweep-frequency operation which was every 14 or 21 s. One of six frequencies (0.12, 0.48, 1.00, 1.95, 4.00, or 9.303 MHz) was chosen for use by the experimenter, as desired. Other modes of operation were available, including continuous observation at a selected frequency and a special mixed mode with transmission at a selected one of the six fixed frequencies and sweep reception.

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------- ISIS 2, HARTZ--

INVESTIGATION NAME- COSMIC RADIO NOISE

NSSDC ID- 71-024A-10 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
IONOSPHERES AND RADIO PHYSICS

PERSONNEL
PI - T.R. HARTZ(RETIRED) DOC-CRC
PI - H.G. JAMES(FORMER) DOC-CRC

BRIEF DESCRIPTION
This experiment used the sweep-frequency ionosonde receiver automatic gain control voltages to measure galactic and solar radio-noise levels. The receiver swept from 0.1 to 20 MHz. The dynamic range was 50 dB, and the bandwidth was 55 kHz. The antennas used were 18.7-m and 73-m dipoles.

------- ISIS 2, MAIER--

INVESTIGATION NAME- RETARDING POTENTIAL ANALYZER

NSSDC ID- 71-024A-08 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
AERONOMY

PERSONNEL
PI - E.J. MAIER(FORMER) NASA-GSFC
OI - B.E. TROY, JR.(FORMER) US NAVAL RESEARCH LAB
OI - J.L. DONLEY(FORMER) NASA-GSFC

BRIEF DESCRIPTION
The primary objective of this experiment was to measure the positive ion density, composition, and temperature in the vicinity of the spacecraft. A secondary objective was to measure the thermal electron density and temperature, and the flux of suprathermal electrons. This retarding potential analyzer consisted of three grids (aperture grid, retarding grid, and suppressor grid) that provided a volt-ampere curve relating sweep voltage on the retarding grid to current flow to the collector. Analysis of the volt-ampere curves provided ion/electron temperatures and densities. This experiment was designed to operate only with the satellite in a cartwheel mode of operation. In this mode, the spin axis was perpendicular to the orbit plane. This allowed the analyzer aperture to face the direction of satellite motion once each spin period. NSSDC has all the useful data that exist from this investigation.

------- ISIS 2, MCDIARMID--

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTORS

NSSDC ID- 71-024A-04 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - I.B. MCDIARMID(FORMER) NATL RES COUNC OF CAN
OI - J.R. BURROWS(FORMER) NATL RES COUNC OF CAN

BRIEF DESCRIPTION
The objectives of the energetic particle experiment were to provide data that would aid in the understanding of (1) the mechanisms responsible for the production and control of the outer radiation zone, (2) the related problem of solar-flare particle entry into the earth's magnetic field, and (3) interactions between the earth's magnetosphere and the solar wind. This experiment consisted of four sets of detectors. The first set consisted of three Geiger counters (one of which failed after launch) and measured electrons greater than 20 and 40 keV perpendicular and parallel to the spin axis. These Geiger counters were also sensitive to protons with energies greater than 240 and 600 keV, respectively. All remaining detectors measured particles perpendicular to the spin axis. The second set consisted of two solid-state, silicon-junction detectors. Both detectors were operated in low- and high-threshold mode, while one could additionally be switched to another discrimination level. They measured electrons with energies greater than 40, 60, 90, 120, 150, and 200 keV. They were also sensitive to protons with energies greater than 150, 200, and 750 keV. The switchable detector experienced continuous saturation. The third set consisted of three silicon-junction detectors that measured protons in the energy ranges 0.8 to 4.0, 3.2 to 12.7, and 12.9 to 28.0 MeV, alpha particles in the energy range 2.5 to 16.0 MeV, and electrons in the energy range 1.0 to 2.0 MeV. The fourth set was composed of two cesium iodide scintillation-photomultiplier systems (channeltrons with cylindrical electrostatic analyzers) stepped through eight energies in 64/60 of a second. These differential spectrometers measured electrons at 9.6, 7.8, 6.0, 4.1, 3.0, 2.2, 1.3, and 0.15 keV, and measured protons at 26.2, 21.6, 17.0, 12.4, 9.4, 7.6, 5.2, and 2.2 keV.

------- ISIS 2, SHEPHERD--

INVESTIGATION NAME- 6300-A PHOTOMETER

NSSDC ID- 71-024A-12 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS
AERONOMY

PERSONNEL
PI - G.G. SHEPHERD(FORMER) YORK U

BRIEF DESCRIPTION
A two-channel photometer was used to measure directly and to map the intensity of the atomic oxygen red line at 6300 A in day, twilight, and night airglow and aurora. Each channel had its own optical input, and the two inputs were mounted at the same end of the spacecraft, separated by 180 deg, with their axes at 90 deg to the spacecraft's spin axis. One optical input was characterized by a spectral bandwidth of 12 A centered around the 6300-A line of atomic oxygen, and the other input was used for white-light measurements. The spinning satellite caused the photometer to alternately view the earth and then the sky; i.e., when one sensor viewed the earth, the other sensor saw the dark sky. Both sensors had a 2.5-deg circular field of view. With the use of a beam-combiner arrangement, the same photomultiplier accepted the two inputs. The dynamic range of intensity measurements was from about 1.E11 photons/(sq m-s) (10 rayleighs) to more than 1.E16 photons/(sq m-s). Sunlight could enter the optical systems directly in addition to earth-reflected light. The instrument baffle was illuminated by the sun only for the off-axis angles less than 47 deg. Outside this limit, the data were not degraded by sunlight, permitting normal operation in the region of the orbit where the spacecraft was in sunlight, but the portion of the earth beneath it was dark. An external light source "saw" the filter only when it was 7.5 deg or less off axis. In the range 7.5 to 47 deg, good data were still obtained when the sunlit earth was the origin of the contamination. To perform the data analysis, it was necessary, among other operations, to evaluate different geometrical situations, and to locate the point at which the 12-A bandpass photometer's FOV crosses the earth's leading limb so that the data could be organized into spin maps. For more details see G. G. Shepherd et al. "ISIS-II atomic oxygen red line photometer," Applied Optics, v. 12, n. 8, pp. 1767-1774, August 1973.

------- ISIS 2, WHITTEKER--

INVESTIGATION NAME- SWEEP-FREQUENCY SOUNDER

NSSDC ID- 71-024A-01 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL
PI - J.H. WHITTEKER(FORMER) DOC-CRC
PI - D.B. MULDREW(FORMER) DOC-CRC
OI - J. TURNER(FORMER) IONOSPHERIC PRED SERV
OI - M. SYLVAIN(FORMER) LGE
OI - O. HOLT(FORMER) AURORAL OBS
OI - Y. OGATA(FORMER) RADIO RESEARCH LAB
OI - R. RAGHAVARAO(FORMER) PHYSICAL RESEARCH LAB
OI - J.E. JACKSON(FORMER) NASA-GSFC
OI - R.B. NORTON(FORMER) NOAA-ERL
OI - K.L. CHAN(FORMER) NASA-ARC
OI - R.S. UNWIN(FORMER) DEPT OF SCI+INDUST RES

BRIEF DESCRIPTION
The purpose of this experiment was to measure the ionospheric electron density in the altitude range 300 to 1400 km. Another important function of the sounder was to provide correlative data for the other ISIS 2 experiments, particularly those measuring ionospheric parameters. The ISIS 2 ionosonde was a radio transmitter that recorded the time delay between a transmitted and returned radio-frequency pulse. A continuum of frequencies between 0.1 and 20 MHz was sampled every 14 or 21 s, and one of six selected frequencies was also used for sounding for a few seconds during each 14- or 21-s period. In addition to the sweep- and fixed-frequency modes of operation, a mixed mode was available in which the transmitter frequency was fixed at one of six possible frequencies while the receiver swept. Several virtual-range (delay-time) traces resulting from ground reflections, plasma resonances, birefringence of the ionosphere, nonvertical propagation, etc., were normally observed. Virtual range at a given frequency was primarily a function of distance traversed by the signal, electron density along the propagation path, and mode of propagation. The standard data format was an ionogram (graph) showing virtual range as a function of radio frequency.

•••••••••••••••••••••••••••• IUE ••••••••••••••••••••••••••••

SPACECRAFT COMMON NAME- IUE
ALTERNATE NAMES- INT ULTRAVIOLET EXPL, SAS-D
10637

NSSDC ID- 78-012A

LAUNCH DATE- 01/26/78 WEIGHT- [illegible] KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

INTERNATIONAL	ESA
UNITED STATES	NASA-OSSA
UNITED KINGDOM	SRC

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 01/27/78
ORBIT PERIOD- 1436.6 MIN	INCLINATION- 28.8 DEG
PERIAPSIS- 26643. KM ALT	APOAPSIS- 44951. KM ALT

PERSONNEL

MG - J.W. WARNER	NASA HEADQUARTERS
SC - E.J. WEILER	NASA HEADQUARTERS
PM - J.P. CORRIGAN	NASA-GSFC
PS - Y. KONDO	NASA-GSFC

BRIEF DESCRIPTION

The International Ultraviolet Explorer (IUE, formerly SAS-D) satellite was a spaceborne ultraviolet astronomical observatory for use as an international facility. The IUE contained a 45-cm telescope solely for spectroscopy in the wavelength range of 1150 to 3250 A. The satellite and optical instrumentation were provided by the Goddard Space Flight Center (GSFC). The television cameras, used as detectors, were provided by the United Kingdom Science Research Council (UKSRC). The European Space Agency (ESA, formerly ESRO) supplied solar paddles for the satellite and a European Control Center. After launch, two-thirds of the observing time was directed from a control center at GSFC; one-third of the time, the satellite was operated from the European Control Center near Madrid. The IUE observatory was in a synchronous orbit. The 45-cm Ritchey-Chretien f/15 telescope fed a spectrograph package. The spectrograph package, using secondary electron conduction (SEC) Vidicon cameras as detectors, covered the spectral range from 1150 to 3250 A, operating in either a high- or low-resolution mode with resolutions of approximately 0.1 and 6 A, respectively. The SEC Vidicons could integrate the signal for up to many hours. This integration time limited detection in the high- and low-resolution modes to approximately 5 and 0.03 photons/(sq cm-s-A), respectively, for a signal-to-noise ratio of 50. Listings of guest observers and their investigations can be obtained from the IUE Newsletter, IUE Observatory, Code 684, Goddard Space Flight Center, Greenbelt, Maryland, 20771, U.S.A.

------- IUE, GUEST INVESTIGATORS-------------------------------

INVESTIGATION NAME- LOW-/HIGH-RESOLUTION, ULTRAVIOLET SPECTROGRAPH PACKAGE

NSSDC ID- 78-012A-01 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL
PI - GUEST INVESTIGATORS SEE EXPER. DESCRIPT.

BRIEF DESCRIPTION

This experiment included the ultraviolet spectrograph package carried by the IUE, consisting of two physically distinct echelle-spectrograph/camera units capable of astronomical observations. Each spectrograph was a three-element echelle system composed of an off-axis paraboloidal collimator, an echelle grating, and a spherical first-order grating that was used to separate the echelle orders and focus the spectral display on an image converter plus SEC Vidicon camera. There was a spare camera for each unit. The camera units were able to integrate the signal. The readout/preparation cycle for the cameras took approximately 20 min. Wavelength calibration was provided by the use of a hollow cathode comparison lamp. The photometric calibration was accomplished by observing standard stars whose spectral fluxes had previously been calibrated by other means. Both echelle-spectrograph/camera units were capable of high-resolution (0.1 A) or low-resolution (6 A) performance. The dual high/low-resolution capability was implemented by the insertion of a flat mirror in front of the echelle grating, so that the only dispersion was provided by the spherical grating. As the SEC Vidicons could integrate the signal for up to many hours, data with a signal-to-noise ratio of 50 could be obtained for 80 stars of 9th and 14th magnitudes in the high- and low-resolution modes, respectively. The distinguishing characteristic of the units was their wavelength coverage. One unit covered the wavelength range from 1192 to 1924 A in the high-resolution mode, and 1135 to 2085 A in the low-resolution mode. For the other unit, the ranges were from 1893 to 3031 A and 1800 to 3255 A for the high- and low-resolution modes, respectively. Each unit also had its own choice of entrance apertures: either a 3-arc-s hole or a 10- by 20-arc-s slot. The 10- by 20-arc-s slots could be blocked by a common shutter but the 3-arc-s aperture was always open. As a result, two aperture configurations were possible: (1) both 3-arc-s apertures open and both 10- by 20-arc-s slots closed, or (2) all four apertures open. With this instrumentation, the observational options open to an observer were long-wavelength and/or short-wavelength spectrograph, high or low resolution, and large or small apertures. Exposures could be made with the two spectrographs simultaneously but the entrance apertures for each were distinct and separated in the sky by about 1 arc-min. An additional restriction was that data could be read out from only one camera at a time. However, one camera could be exposed while the other camera was being read out. The choice of high or low resolution could be made independently for the two spectrographs. Listings of guest observers and their investigations can be obtained from the IUE Newsletter, IUE Observatory, Code 684, Goddard Space Flight Center, Greenbelt, Maryland, 20771, U.S.A.

------- IUE, NONE ASSIGNED-------------------------------------

INVESTIGATION NAME- PARTICLE FLUX MONITOR (SPACECRAFT)

NSSDC ID- 78-012A-02 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - NONE ASSIGNED

BRIEF DESCRIPTION

The particle flux monitor experiment was placed in IUE to monitor the trapped electron fluxes that affected the sensitivity of the ultraviolet sensor in the IUE spectrograph package experiment, NSSDC ID 78-012A-01. The particle flux monitor was a lithium-drifted silicon detector with a half-angle conical field of view of 16 deg. It had an aluminum absorber of 0.357 g/sq cm in front of the collimator and a brass shield with a minimum thickness of 2.31 g/sq cm. The effective energy threshold for electron measurements was 1.3 MeV. The experiment was also sensitive to protons with energies greater than 15 MeV. The instrument was used as an operational tool to aid in determining background radiation and acceptable camera exposure time. The data were also useful as a monitor of the trapped radiation fluxes. The instrument was provided by Dr. C. Bostrom of the Applied Physics Laboratory.

•••••••••••••••••••••••••••• LANDSAT 2 ••••••••••••••••••••••••

SPACECRAFT COMMON NAME- LANDSAT 2
ALTERNATE NAMES- EARTH RES TECH SAT.-B, PL-7333
ERTS-B, 07615

NSSDC ID- 75-004A

LAUNCH DATE- 01/22/75 WEIGHT- 816. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 01/25/75
ORBIT PERIOD- 103.28 MIN	INCLINATION- 99.09 DEG
PERIAPSIS- 907. KM ALT	APOAPSIS- 918. KM ALT

PERSONNEL

MG - J.C. WELCH	NASA HEADQUARTERS
PM - C.M. MACKENZIE	NASA-GSFC
PS - S.C. FREDEN	NASA-GSFC

BRIEF DESCRIPTION

Landsat 2 was the second of a series of modified Nimbus satellites. The near-polar orbiting spacecraft served as a stabilized, earth-oriented platform for obtaining information on agricultural and forestry resources, geology and mineral resources, hydrology and water resources, geography, cartography, environmental pollution, oceanography and marine resources, and meteorological phenomena. To accomplish these objectives, the spacecraft was equipped with a three-camera return beam vidicon (RBV) and a four-channel multispectral scanner (MSS) to obtain visible and near IR photographic and radiometric images of the earth. A data collection system (DCS) was also used to collect information from remote individually equipped ground stations and to relay the data to central acquisition stations. Landsat 2 carried two wide-band video tape recorders (WBVTR), capable of storing up to 30 min of scanner or camera data. An advanced attitude control system, consisting of horizon scanners, sun sensors, and a command antenna combined with a freon gas propulsion system, permitted the spacecraft's orientation to be controlled to within plus or minus 0.7 deg in all three axes. Spacecraft communications included a command subsystem operating at 154.2 and 2106.4 MHz and a PCM narrow-band telemetry subsystem, operating at 2287.5 and 137.86 MHz, for spacecraft housekeeping, attitude, and sensor performance data. Video data from the three-camera RBV system were transmitted in both real time and from WBVTR at 2276.5 MHz, while information from the MSS was constrained to a 20-MHz rf bandwidth at 2229.5 MHz.

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------- LANDSAT 2, FREDEN---------------------------------------

INVESTIGATION NAME- MULTISPECTRAL SCANNER (MSS)

NSSDC ID- 75-004A-02 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY
METEOROLOGY

PERSONNEL
PI - S.C. FREDEN NASA-GSFC

BRIEF DESCRIPTION
The Landsat 2 Multispectral Scanner (MSS) was designed to provide repetitive daylight acquisition of high-resolution multispectral data of the earth's surface on a global basis. While its primary function was to obtain information in various areas such as agriculture, forestry, geology, and hydrology, the MSS system was also used for oceanographic and meteorological purposes, i.e., to map sea-ice fields, locate and track major ocean currents, monitor both air and water pollution, determine snow cover, investigate severe storm environments, etc. The MSS consisted of a 22.86-cm double reflector-type telescope, scanning mirror, filters, detectors, and associated electronics. The scanner operated in the following spectral intervals: (1) 0.5 to 0.6 micrometer, (2) 0.6 to 0.7 micrometer, (3) 0.7 to 0.8 micrometer, and (4) 0.8 to 1.1 micrometers (these bands were designated as bands 4, 5, 6, and 7, respectively). Incoming radiation was collected by the scanning mirror, which oscillated 2.89 deg to either side of nadir and scanned cross-track swaths 185 km wide. The along-track scan was produced by the orbital motion of the spacecraft. The primary image produced at the image plane was relayed by use of fiber-optic bundles to detectors where conversion to an electronic signal was accomplished. Optical filters were used to produce the desired spectral separation. Six detectors were employed in each of the four spectral bands: bands 4 through 6 used photomultiplier tubes as detectors, band 7 used silicon photodiodes. A multiplexer included in the MSS system processed the scanner's 24 channels of data. These data were time-multiplexed and then converted to a pulse-code modulated signal by an A/D converter. The data were then transmitted (at 2229.5 MHz) directly to an acquisition station or stored on magnetic tape for subsequent playback the next time the spacecraft came within communication range of an acquisition station. Data from this experiment are handled by the NASA Data Processing Facility, GSFC, Greenbelt, Md., and are available to approved investigators through its Landsat users' services section. All other interested individuals may obtain data through the EROS Data Center, Department of Commerce, Sioux Falls, S.D.

************************** LANDSAT 3**************************

SPACECRAFT COMMON NAME- LANDSAT 3
ALTERNATE NAMES- EARTH RES TECH SAT.-C, ERTS-C
10702, LANDSAT-C

NSSDC ID- 78-026A

LAUNCH DATE- 03/05/78 WEIGHT- 960. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 03/06/78
ORBIT PERIOD- 103.1 MIN INCLINATION- 99.1 DEG
PERIAPSIS- 897. KM ALT APOAPSIS- 914. KM ALT

PERSONNEL
MG - J.C. WELCH NASA HEADQUARTERS
PS - S.C. FREDEN NASA-GSFC

BRIEF DESCRIPTION
Landsat 3 was a modified version of the Nimbus satellite, with the general mission objective of extending the period of space-data acquisition for earth resources initiated by Landsat 1 (formerly ERTS 1) and continued by Landsat 2. The near-polar orbiting spacecraft served as a stabilized, earth-oriented platform for obtaining information on agricultural and forestry resources, geology and mineral resources, hydrology and water resources, geography, cartography, environmental pollution, oceanography and marine resources, and meteorological phenomena. To accomplish these objectives, the spacecraft was equipped with a two-camera return beam vidicon (RBV) and a five-channel multispectral scanner (MSS) to obtain both visible and IR photographic and radiometric images of the earth. A data collection system was also used to collect information from remote individually equipped ground stations and to relay the data to central acquisition stations. Landsat 3 carried two wide-band video tape recorders (WBVTR) capable of storing up to 30 min of scanner or camera data. An advanced attitude control system, consisting of horizon scanners, sun sensors, and a command antenna combined with a freon gas propulsion system, permitted the spacecraft's orientation to be controlled to within plus or minus 1.0 deg in all three axes. Spacecraft communications included a command subsystem, operating at 154.2 and 2106.4 MHz, and a PCM narrow-band telemetry subsystem, operating at 2287.5 and 137.86 MHz, for spacecraft housekeeping, attitude, and sensor performance data. Video data from the two-camera RBV system were transmitted in both real time and from the wide-band recorder system at 2265.5 MHz, while information from the MSS was constrained to a 20-MHz rf bandwidth at 2229.5 MHz.

------- LANDSAT 3, FREDEN---------------------------------------

INVESTIGATION NAME- RETURN BEAM VIDICON CAMERA (RBV)

NSSDC ID- 78-026A-01 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY
METEOROLOGY

PERSONNEL
PI - S.C. FREDEN NASA-GSFC

BRIEF DESCRIPTION
The Landsat 3 Return Beam Vidicon (RBV) camera system contained two identical cameras covering the spectral band from 0.53 to 0.75 micrometer. The two earth-oriented cameras were mounted on a common base, structurally isolated from the spacecraft to maintain accurate alignment. Each camera contained an optical lens, a RBV sensor, a thermoelectric cooler, deflection and focus coils, a mechanical shutter, erase lamps, and sensor electronics. The cameras were aligned to view adjacent 98-km square ground scenes which overlapped slightly so that the total width of the ground scene was 185 km. The cameras were operated every 12.5 s to produce overlapping images along the direction of spacecraft motion. After shuttering, the image was scanned by an electron beam to produce a video output signal. The timing cycle was arranged so that a 3.5-s offset was introduced between the readouts of the two cameras, permitting sequential readout of the cameras, allowing the same tape recorder and communication channel to be used. Video data from the RBV were transmitted (at 2265.5 MHz) in both real-time and tape-recorder modes. From a nominal spacecraft altitude of 912 km, the RBV had a ground resolution of 40 m (twice the Landsat 1 resolution of 80 m). Data from this experiment were handled by the NASA Data Processing Facility, GSFC, Greenbelt, Md., and were made available to approved investigators and agencies through its Landsat users' services section. All other interested individuals can obtain data through the EROS Data Center, Department of Commerce, Sioux Falls, S.D.

------- LANDSAT 3, FREDEN---------------------------------------

INVESTIGATION NAME- MULTISPECTRAL SCANNER (MSS)

NSSDC ID- 78-026A-02 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY
METEOROLOGY

PERSONNEL
PI - S.C. FREDEN NASA-GSFC

BRIEF DESCRIPTION
The Landsat 3 Multispectral Scanner (MSS) provided repetitive day/night acquisition of high-resolution multispectral data on the earth's surface on a global basis. While its primary function was to obtain data in various areas such as agriculture, forestry, geology, and hydrology, the MSS system was also used for oceanographic and meteorological purposes, i.e., to map sea-ice fields, locate and track major ocean currents, monitor both air and water pollution, determine snow cover, investigate severe storm environments, etc. The MSS consisted of a double reflector-type telescope, scanning mirror, filters, detectors, and associated electronics. The scanner operated in the following spectral intervals: (1) 0.5 to 0.6 micrometer, (2) 0.6 to 0.7 micrometer, (3) 0.7 to 0.8 micrometer, (4) 0.8 to 1.1 micrometers, and (5) 10.4 to 12.6 micrometers (these bands were designated as bands 4, 5, 6, 7, and 8, respectively). The last band, which lies in the thermal (emissive) part of the spectrum, gave Landsat 3 nighttime sensing capabilities. But this thermal band failed on July 11, 1978, and produced little useful data. Incoming radiation was collected by the scanning mirror, which oscillated 2.89 deg to either side of nadir and scanned cross-track swaths 185 km wide. The along-track scan was produced by the orbital motion of the spacecraft. The primary image produced at the image plane was relayed by use of fiber-optic bundles to detectors where conversion to an electronic signal was accomplished. Optical filters were used to produce the desired spectral separation. Six detectors were employed in each of the first four spectral bands and two in the fifth band: bands 4 through 6 used photomultiplier tubes as detectors, band 7 used silicon photodiodes, and band 8 used mercury-cadmium-telluride detectors. The minimum dimensions that were resolved by the MSS were 80 m for bands 4 through 7 and 240 m for band 8. A multiplexer included in the MSS system processed the scanner's 26 channels of data. These data were time-multiplexed and then converted to a PCM signal by an A/D converter. The data were transmitted (at 2229.5 MHz) directly to an acquisition station or stored on magnetic tape for subsequent playback the next time the spacecraft came within communication range of an acquisition station. Data from this experiment were handled by

the NASA Data Processing Facility, GSFC, Greenbelt, Md., and were made available to approved investigators through its Landsat users' services. All other interested individuals can obtain data through the EROS Data Center, Department of Commerce, Sioux Falls, S.D.

------- LANDSAT 3, KENNY--

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 78-026A-03 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS
EARTH RESOURCES SURVEY

PERSONNEL
PI - W. KENNY NASA-GSFC

BRIEF DESCRIPTION
The Landsat 3 Data Collection System (DCS) provided users with near real-time data collected from various remote locations. The DCS was composed of (1) the data collection platforms (DCPs) which might have been ocean buoys, constant pressure balloons, or automatic ground stations, (2) the satellite equipment, and (3) the ground data centers, including remote receiving sites and the ground data handling system at GSFC. Use of the Landsat spaceborne DCS provided a continual flow of information for better management of wildlife, marine, agriculture, water, and forestry resources and led to improved weather forecasts, pollution control, and earthquake prediction and warning. The environmental sensors mounted on a DCP were selected by individual investigators to satisfy their particular requirements. From an orbital altitude of 912 km, the spacecraft was capable of acquiring data from DCPs within a radius of approximately 3100 km from the subsatellite point, thus allowing data to be obtained from any remote platform at least once every 12 h. The DCPs transmitted at 401.55 MHz. The DCS equipment, essentially a receiver, received and retransmitted data (at 2287.5 MHz) to selected ground receiving stations. There was no signal multiplexing or data processing on the satellite. The Landsat 3 DCS accommodated up to 1000 DCPs deployed throughout the continental United States. Data from this experiment were handled and distributed to the various platform investigators by the NASA Data Processing Facility, GSFC, Greenbelt, Md.

*************************** LANDSAT 4 *************************

SPACECRAFT COMMON NAME- LANDSAT 4
ALTERNATE NAMES- LFO-A, LANDSAT-D
13367

NSSDC ID- 82-072A

LAUNCH DATE- 07/16/82 WEIGHT- 1407. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA
UNITED STATES NOAA-NESS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 07/17/82
ORBIT PERIOD- 98.5 MIN INCLINATION- 98.3 DEG
PERIAPSIS- 678. KM ALT APOAPSIS- 696. KM ALT

PERSONNEL
MG - B.B. SCHARDT NASA HEADQUARTERS
PM - L. GONZALES NASA-GSFC
PS - V.V. SALOMONSON NASA-GSFC

BRIEF DESCRIPTION
The Landsat 4 system was an experimental earth resources monitoring system with the new powerful remote-sensing capabilities of the thematic mapper (TM), and it provided a transition for both foreign and domestic users from the multispectral scanner (MSS) data to the higher resolution and data rate of the TM. It had a complete end-to-end highly automated data system, which was designed to be a new generation system, and was a major step forward in global remote-sensing applications. The Landsat 4 mission consisted of an orbiting satellite (flight segment) with the necessary wideband data links and support systems, and a ground segment. The Landsat 4 flight segment consisted of two major systems: (1) the instrument module, containing the instruments together with the mission unique subsystems, such as the solar array and drive, the TDRS antenna, the wide-band module (WBM), and the global positioning system (GPS); and (2) the multimission modular spacecraft (MMS) that contained the modularized and standardized power, propulsion, attitude control, and communications and data handling subsystems. The flight segment was designed with 3 years nominal lifetime in orbit and could be extended through in-orbit replacement capability when the Space Shuttle became operational. The spacecraft was placed into an orbit having a descending node equatorial crossing between 9:30 and 10:00 a.m. local time. The spacecraft and attendant sensors were operated through the GSTDN stations before the Tracking And Data Relay Satellite System (TDRSS) was available. [An identical back-up spacecraft, Landsat-D Prime (NSSDC ID Landsat-E) was placed in storage and launched on March 1, 1984.] On October 1, 1982, NOAA assumed responsibility for Landsat data production and archiving activities at the Department of Interior's EROS Data Center. On January 31, 1983, NOAA also took over the MSS operation and maintenance of the Landsat spacecraft and ground system resources from NASA. The RBV operation was under NOAA as of Oct. 1, 1984.

------- LANDSAT 4, BARKER--

INVESTIGATION NAME- THEMATIC MAPPER (TM)

NSSDC ID- 82-072A-01 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY
METEOROLOGY

PERSONNEL
PI - J. BARKER NASA-GSFC

BRIEF DESCRIPTION
The Thematic Mapper (TM) was a seven-band, earth-looking, scanning radiometer with a 30-m ground element resolution covering a 185-km ground swath from a 705-km altitude. The instrument consisted of primary imaging optics, scanning mechanism, spectral band discrimination optics, detector arrays, radiative cooler, inflight calibrator, and required operating and processing electronics. The scanning mechanism provided the cross-track scan, while the progress of the spacecraft provided the scan along the track. Seven spectral bands were used to provide the spectral signature capability of the instrument: band 1, 0.45-0.52 micrometer; band 2, 0.52-0.60 micrometer; band 3, 0.63-0.69 micrometer; band 4, 0.76-0.90 micrometer; band 5, 1.55-1.75 micrometers; band 6, 10.40-12.50 micrometers; and band 7, 2.08-2.35 micrometers. The optical system imaged an area on the earth's surface 30 m by 30 m (120 m by 120 m for band 6). Several lines were scanned simultaneously to permit suitable dwell time for each resolution element. The variation in radiant flux passing through the field stop onto the photo and thermal detectors created an electrical output that represented the radiant history of the line. The information outputs from the detector channels were processed in the TM multiplexer for transmission via the Tracking And Data Relay Satellites (TDRS) and/or direct readout to local receiving stations. For information of archival data, contact the EROS Data Center, Department of Commerce, Sioux Falls, S.D.

------- LANDSAT 4, FEINBERG--

INVESTIGATION NAME- GLOBAL POSITIONING SYSTEM (GPS)

NSSDC ID- 82-072A-03 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION

PERSONNEL
PI - P.M. FEINBERG NASA-GSFC

BRIEF DESCRIPTION
The Global Positioning System (GPS) was a Department of Defense program to provide very precise position and timing information to a variety of users. The GPS assembly on Landsat 4 operated in two phases. The first phase (approximately 90 days) was an experimental one to validate and calibrate the position and timing information provided by the GPS assembly. The second phase called for operational use of the GPS data by Landsat 4.

------- LANDSAT 4, SALOMONSON--

INVESTIGATION NAME- MULTISPECTRAL SCANNER (MSS)

NSSDC ID- 82-072A-02 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY
METEOROLOGY

PERSONNEL
PI - V. SALOMONSON NASA-GSFC

BRIEF DESCRIPTION
The Landsat 4 Multispectral Scanner (MSS) provided repetitive daytime acquisition of high-resolution multispectral data of the earth's surface on a global basis. While its primary function was to provide an alternate to the thematic mapper (TM), it provided data for agriculture, forestry, geology, and hydrology. The MSS system was also used for oceanographic and meteorological purposes, i.e., to map sea-ice, fields, locate and track major ocean currents, monitor both air and water pollution, determine snow cover, investigate severe storm environments, etc. The MSS consisted of a double reflection-type telescope, scanning mirror, filters, detectors, and associated electronics. The scanner operated in the following spectral intervals: band 1, 0.5 to 0.6 micrometers; band 2, 0.6 to 0.7 micrometers; band 3, 0.7 to 0.8 micrometers; band 4, 0.8 to 1.1 micrometers (the band numbering was different from Landsats 1-3). The Landsat 4 MSS was similar to

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the Landsat 3 MSS except for changes necessary to accommodate the lower orbital altitude. The swath width of 185 km remained the same by increasing the FOV of the sensors from 11.56 to 14.92 deg. The ground resolution was 82.6 m for all four bands. The primary image produced at the image plane was relayed by use of fiber-optic bundles to detectors where conversion to an electronic signal was accomplished. Optical filters were used to produce the desired spectral separation. Six detectors were employed in each of the four spectral bands: bands 1 through 3 used photomultiplier tubes as detectors, and band 4 used silicon photodiodes. A multiplexer included in the MSS system processed the scanner's 24 channels of data. These data were time-multiplexed and then converted to a PCM signal by an A/D converter. The data were transmitted via the Tracking And Data Relay Satellites (TDRS) and/or direct readout to local receiving stations. For information about archival data, contact the EROS Data Center, Department of Commerce, Sioux Falls, S.D.

***************************** LANDSAT 5 ************************

SPACECRAFT COMMON NAME- LANDSAT 5
ALTERNATE NAMES- LAND SATELLITE-E, LANDSAT-D1
14780

NSSDC ID- 84-021A

LAUNCH DATE- 03/01/84 WEIGHT- 1407. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

UNITED STATES	NASA-OSSA
UNITED STATES	NOAA-NESS

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 03/02/84
ORBIT PERIOD- 98.6 MIN	INCLINATION- 98.3 DEG
PERIAPSIS- 683. KM ALT	APOAPSIS- 698. KM ALT

PERSONNEL

MG - B.B.	SCHARDT	NASA HEADQUARTERS
PM - L.	GONZALES	NASA-GSFC
PS - V.V.	SALOMONSON	NASA-GSFC

BRIEF DESCRIPTION

The Landsat 5 system was an experimental earth resources monitoring system with the new powerful remote-sensing capabilities of the thematic mapper (TM), and it provides a transition for both foreign and domestic users from the multispectral scanner (MSS) data (which are also part of the instrument package) to the higher resolution and data rate of the TM. It had a complete end-to-end highly automated data system, which was designed to be a new generation system, and was a major step forward in global remote-sensing applications. The Landsat 5 mission consisted of an orbiting satellite (space segment) with the necessary wideband data links and support systems, and a ground segment. The Landsat 5 was an identical back-up for Landsat 4 (NSSDC ID 82-072A). The Landsat 5 space segment consisted of two major systems: (1) the instrument module, containing the instruments together with the mission unique subsystems, such as the solar array and drive, the TDRS antenna, the wide-band module (WBM), and the global positioning system (GPS), and (2) the multimission modular spacecraft (MMS) that contained the modularized and standardized power, propulsion, attitude control, and communications and data handling subsystems. When the Landsat 5 satellite was launched, it was deployed at an orbital altitude of 705.3 km, with inclination of 98.2 deg, and with a descending node equatorial crossing at 9:30 a.m. local time. This orbit had a frequency of 19-9/16 orbits per day and covers the earth in 16 days. The distance between ground tracks was 172 km, which, when used in conjunction with the 185-km TM and MSS swath width, provided an overlap of 7.6%. The space segment was designed with 3 years nominal lifetime in orbit and can be extended through in-orbit replacement capability by the Space Shuttle. The spacecraft and attendant sensors were operated through the Tracking And Data Relay Satellite System (TDRSS).

------- LANDSAT 5, BARKER---

INVESTIGATION NAME- THEMATIC MAPPER (TM)

NSSDC ID- 84-021A-01

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY
METEOROLOGY

PERSONNEL

PI - J.	BARKER	NASA-GSFC

BRIEF DESCRIPTION

The Thematic Mapper (TM) was a seven-band, earth-looking, scanning radiometer with a 30-m ground element resolution covering a 185-km ground swath from a 705-km altitude. The instrument consisted of primary imaging optics, scanning mechanism, spectral band discrimination optics, detector arrays, radiative cooler, inflight calibrator, and required operating and processing electronics. The scanning mechanism provided the cross-track scan while the progress of the spacecraft provided the scan along the track. Seven spectral bands were used to provide the spectral signature capability of the instrument: band 1, 0.45-0.52 micrometer; band 2, 0.52-0.60 micrometer; band 3, 0.63-0.69 micrometer; band 4, 0.76-0.90 micrometer; band 5, 1.55-1.75 micrometers; band 6, 10.40-12.50 micrometers; and band 7, 2.08-2.35 micrometers. The optical system imaged an area on the earth's surface 30 m by 30 m (120 m by 120 m for band 6). Several lines were scanned simultaneously to permit suitable dwell time for each resolution element. The variation in radiant flux passing through the field stop onto the photo and thermal detectors created an electrical output that represented the radiant history of the line. The information outputs from the detector channels were processed in the TM multiplexer for transmission via the Tracking And Data Relay Satellites (TDRS) and/or direct readout to local receiving stations. Archival data were available through the EROS Data Center, Department of Commerce, Sioux Falls, S.D.

------- LANDSAT 5, FEINBERG---

INVESTIGATION NAME- GLOBAL POSITIONING SYSTEM (GPS)

NSSDC ID- 84-021A-03

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION

PERSONNEL

PI - P.M.	FEINBERG	NASA-GSFC

BRIEF DESCRIPTION

The Global Positioning System (GPS) was a Department of Defense program to provide very precise position and timing information to a variety of users. The GPS assembly on Landsat 5 operated in two phases. The first phase (approximately 90 days) was an experimental one to validate and calibrate the position and timing information provided by the GPS assembly. The second phase called for operational use of the GPS data by Landsat 5.

------- LANDSAT 5, SALOMONSON---

INVESTIGATION NAME- MULTISPECTRAL SCANNER (MSS)

NSSDC ID- 84-021A-02

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY
METEOROLOGY
OCEANOGRAPHY

PERSONNEL

PI - V.	SALOMONSON	NASA-GSFC

BRIEF DESCRIPTION

The Landsat 5 Multispectral Scanner (MSS) provided repetitive day/night acquisition of high-resolution multispectral data of the earth's surface on a global basis. While its primary function was to provide an alternate to the thematic mapper (TM), it provided data for agriculture, forestry, geology, and hydrology. The MSS system was also used for oceanographic and meteorological purposes, i.e., to map sea-ice fields, locate and track major ocean currents, monitor both air and water pollution, determine snow cover, investigate severe storm environments, etc. The MSS consisted of a double reflection-type telescope, scanning mirror, filters, detectors, and associated electronics. The scanner operated in the following spectral intervals: band 1, 0.5 to 0.6 micrometers; band 2, 0.6 to 0.7 micrometers; band 3, 0.7 to 0.8 micrometers; and band 4, 0.8 to 1.1 micrometers. The swath width was 185 km; the ground resolution was 82.6 m for all four bands. The primary image produced at the image plane was relayed by use of fiber-optic bundles to detectors where conversion to an electronic signal was accomplished. Optical filters produced spectral separation. Six detectors were employed in each of the first four spectral bands: bands 1 through 3 used photomultiplier tubes as detectors, and band 4 used silicon photodiodes. A multiplexer included in the MSS system processed the scanner's 24 channels of data. These data were time-multiplexed and then converted to a PCM signal by an A/D converter. The data were transmitted directly to an acquisition station via the TDRSS. Data from this experiment were available through the EROS Data Center, Department of Commerce, Sioux Falls, S.D.

***************************** METEOSAT 1 ************************

SPACECRAFT COMMON NAME- METEOSAT 1
ALTERNATE NAMES- METEOROLOGICAL SAT-A, METOSAT
10489

NSSDC ID- 77-108A

LAUNCH DATE- 11/23/77 WEIGHT- 625.8 KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 11/24/77
ORBIT PERIOD- 1411.5 MIN INCLINATION- 0.7 DEG
PERIAPSIS- 34913. KM ALT APOAPSIS- 35692. KM ALT

PERSONNEL
PM - J. AASTED ESA-TOULOUSE

BRIEF DESCRIPTION
Meteosat 1 was a geostationary spacecraft that served as part of European Space Agency's (ESA) contribution to the Global Atmospheric Research Program (GARP). As part of GARP, the satellite helped to supply data required for global data sets used in improvement of machine weather forecasts. In general, the spacecraft design, instrumentation, and operation were similar to SMS/GOES. The spin-stabilized spacecraft carried (1) a visible-IR radiometer to provide high-quality day/night cloudcover data and to take radiance temperatures of the earth/atmosphere system, and (2) a meteorological data collection system to disseminate image data to user stations, to collect data from various earth-based platforms, and to relay data from polar-orbiting satellites. The cylindrically shaped spacecraft measured 210 cm in diameter and 430 cm in length, including the apogee boost motor. The primary structural members were an equipment platform and a central tube. The radiometer telescope was mounted on the equipment platform and viewed the earth through a special aperture in the side of the spacecraft. A support structure extended radially out from the central tube and was affixed to the solar panels, which formed the outer walls of the spacecraft and provided the primary source of electrical power. Located in the annulus-shaped space between the central tube and the solar panels were stationkeeping and dynamics control equipment and batteries. Proper spacecraft attitude and spin rate (approximately 100 rpm) were maintained by jet thrusters mounted on the spacecraft and activated by ground command. The spacecraft used both UHF-band and S-band frequencies in its telemetry and command subsystems. A low-power VHF transponder provided telemetry and command during launch and then served as a backup for the primary subsystem once the spacecraft attained synchronous orbit. Meteosat 1 was originally placed in a geosynchronous orbit near the prime meridian and was positioned later between 9 and 11 deg E.

------- METEOSAT 1, PERA---

INVESTIGATION NAME- DATA COLLECTION PLATFORM (DCP)

NSSDC ID- 77-108A-02 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - L. PERA ESA-TOULOUSE

BRIEF DESCRIPTION
The data collection system was designed to (1) disseminate image data to user stations, (2) collect data from various earth-based platforms, and (3) provide for a space-to-space relay for data from polar-orbiting satellites. This experiment was similar to the meteorological data collection and transmission system (WEFAX) flown on SMS 1, SMS 2, and GOES series spacecraft. This experiment operated on S-band frequencies for WEFAX-type transmissions and UHF for data collection platform report and interrogation.

**************************** METEOSAT 2************************

SPACECRAFT COMMON NAME- METEOSAT 2
ALTERNATE NAMES- METEOROLOGICAL SAT-B, METEOSAT-B

NSSDC ID- 81-057A

LAUNCH DATE- 06/19/81 WEIGHT- 625.8 KG
LAUNCH SITE- KOUROU (CENTRE SPATIAL GUYANAIS), FRENCH GUIANA
LAUNCH VEHICLE- ARIANE

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 06/27/81
ORBIT PERIOD- 1442.1 MIN INCLINATION- 1.01 DEG
PERIAPSIS- 35847. KM ALT APOAPSIS- 35973. KM ALT

PERSONNEL
PM - J. AASTED ESA-TOULOUSE

BRIEF DESCRIPTION
Meteosat 2 was a geostationary spacecraft which served as part of the European Space Agency's (ESA) contribution to the Global Atmospheric Research Program (GARP). As part of GARP, the satellite helped to supply data required for global data sets used in improvement of machine weather forecasts. In general, the spacecraft design, instrumentation, and operation were similar to SMS/GOES. The spin-stabilized spacecraft carried (1) a visible-IR radiometer that provided high-quality day/night cloudcover data and that took radiance temperatures of the earth/atmosphere system and (2) a meteorological data collection system that disseminated image data to user stations, collected data from various earth-based platforms, and relayed data from polar-orbiting satellites. The cylindrically shaped spacecraft measured 210 cm in diameter and 430 cm in length, including the apogee boost motor. The primary structural members were an equipment platform and a central tube. The radiometer telescope was mounted on the equipment platform and viewed the earth through a special aperture in the side of the spacecraft. A support structure extended radially out from the central tube and was affixed to the solar panels, which formed the outer walls of the spacecraft and provided the primary source of electrical power. Located in the annulus-shaped space between the central tube and the solar panels were stationkeeping and dynamics control equipment and batteries. Proper spacecraft attitude and spin rate (approximately 100 rpm) were maintained by jet thrusters mounted on the spacecraft and activated by ground command. The spacecraft used both UHF-band and S-band frequencies in its telemetry and command subsystems. A low-power VHF transponder provided telemetry and command during launch and then served as a backup for the primary subsystem after the spacecraft had attained synchronous orbit. Meteosat 2 was maintained on station between 1 deg E and 1 deg W.

------- METEOSAT 2, SERENE---

INVESTIGATION NAME- IMAGING RADIOMETER

NSSDC ID- 81-057A-01 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - B. SERENE ESA-TOULOUSE

BRIEF DESCRIPTION
The visible-IR radiometer flown on Meteosat 2 was capable of providing day/night observations of cloud cover and earth/cloud radiance temperature measurements from a synchronous, spin-stabilized satellite for use in (1) operational weather analysis and forecasting and (2) for support to GARP. The five-channel instrument was able to take full pictures of the earth's disk. The three IR channels (two in the 10.5- to 12.5-micrometer region and one in the 5.7- to 7.1-micrometer region), and the two visible channels (0.4- to 1.1-micrometers) used a common optics system. Incoming radiation was received by a scan mirror and collected by an optical system. The scan mirror was set at a nominal angle of 45 deg to the radiometer optical axis, which was aligned parallel to the spin axis of the spacecraft. The spinning motion of the spacecraft (approximately 100 rpm) provided a west-east scan motion when the spin axis of the spacecraft was oriented parallel with the earth's axis. The latitudinal scan was accomplished by sequentially tilting the scanning mirror at the completion of each spin. Resolutions at the sub-satellite point were 2.5 km for the visible, and 5 km for the IR and water-vapor channels. Data from this experiment are available through the European Space Operations Center (ESOC), Darmstadt, W. Germany.

*************************** NIMBUS 6************************

SPACECRAFT COMMON NAME- NIMBUS 6
ALTERNATE NAMES- PL-731B, NIMBUS-F
07924

NSSDC ID- 75-052A

LAUNCH DATE- 06/12/75 WEIGHT- 585. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 06/12/75
ORBIT PERIOD- 107.3 MIN INCLINATION- 100. DEG
PERIAPSIS- 1093. KM ALT APOAPSIS- 1101. KM ALT

PERSONNEL
MG - G.F. ESENWEIN NASA HEADQUARTERS
PM - C.M. MACKENZIE NASA-GSFC
PS - A.J. FLE.G NASA-GSFC

BRIEF DESCRIPTION
The Nimbus 6 research-and-development satellite served as a stabilized, earth-oriented platform for testing advanced systems for sensing and collecting meteorological data on a global scale. The polar-orbiting spacecraft consisted of three major structures: (1) a hollow torus-shaped sensor mount, (2) solar paddles, and (3) a control housing unit connected to the sensor mount by a tripod truss structure. Configured somewhat like an ocean buoy, Nimbus 6 was nearly 3.7 m tall, 1.5 m in diameter at the base, and about 3 m wide with solar paddles extended. The sensor mount that formed the satellite base housed the electronics equipment and battery modules. The lower surface of the torus provided mounting space for sensors and antennas. A box-beam structure mounted within the center of the torus supported the larger sensor experiments. Mounted

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on the control housing unit, which was located on top of the spacecraft, were sun sensors, horizon scanners, and a command antenna. The spacecraft spin axis was pointed at the earth. An advanced attitude-control system permitted the spacecraft's orientation to be controlled to within plus or minus 1 deg in all three axes (pitch, roll, and yaw). The nine experiments selected for Nimbus 6 were (1) earth radiation budget (ERB), (2) electrically scanning microwave radiometer (ESMR), (3) high-resolution infrared radiation sounder (HIRS), (4) limb radiance inversion radiometer (LRIR), (5) pressure modulated radiometer (PMR), (6) scanning microwave spectrometer (SCAMS), (7) temperature-humidity infrared radiometer (THIR), (8) tracking and data relay experiment (T+DRE), and (9) tropical wind energy conversion and reference level experiment (TWERLE). This complement of advanced sensors was capable of (1) mapping tropospheric temperature, water vapor abundance, and cloud water content; (2) providing vertical profiles of temperature, ozone, and water vapor; (3) transmitting real-time data to a geostationary spacecraft (ATS 6); and (4) yielding data on the earth's radiation budget. A more detailed description can be found in "The Nimbus 6 User's Guide" (TRF B23261), available from NSSDC.

------- NIMBUS 6, HOUGHTON -------------------------------------

INVESTIGATION NAME- PRESSURE MODULATED RADIOMETER (PMR)

NSSDC ID- 75-052A-09 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
UPPER ATMOSPHERE RESEARCH

PERSONNEL

PI - J.T.	HOUGHTON	OXFORD U
OI - C.D.	RODGERS	OXFORD U
OI - E.J.	WILLIAMSON	OXFORD U
OI - G.D.	PESKETT	OXFORD U
OI - P.	CURTIS	OXFORD U

BRIEF DESCRIPTION

The Nimbus 6 Pressure Modulator Radiometer (PMR) experiment took radiometric measurements in the 15-micrometer CO_2 band at altitudes between 45 and 70 km on a global scale. By appropriate mathematical retrieval methods, the temperature structures of the upper stratosphere and lower mesosphere were then deduced. The pressure-modulation technique permitted the extension of selective chopping techniques to higher altitudes where the pressure-broadened emission lines in the 15-micrometer CO_2 band became so narrow that conventional spectrometers and interferometers had insufficient spectral resolution. In addition to pressure scanning (in discrete steps), the radiometer also employed Doppler scanning along the direction of flight. The PMR comprised two similar radiometer channels, each consisting of a plane scanning mirror, reference blackbody, pressure-modulator cell, and detector assembly. The plane mirror was gold coated and mounted at 45 deg on a 90-deg stepping motor so that the field of view of the channel could be directed to space or to the internal reference blackbody for inflight range and zero calibration. The motor was mounted on a pair of flexible pivots so that the mirror could be rotated through plus or minus 7-1/2 deg from its rest position to give the required Doppler scan. Major components in the pressure-modulator cell were a movable piston, a diaphragm, and a magnetic drive coil. The detector assembly consisted of a field lens, a condensing light pipe, and a pyroelectric flake bolometer. Each radiometer had a field of view that was 20 deg whole-angle across the spacecraft's line of flight and 40 deg whole-angle parallel to the line of flight. The derived temperature values were within 2 deg K at 65 km and about 0.2 deg K near 50 km with a vertical resolution of 10 km. For a more detailed description, see Section 8 in "The Nimbus 6 User's Guide" (TRF B23261), available from NSSDC. The instrument performed satisfactorily.

------- NIMBUS 6, JULIAN -------------------------------------

INVESTIGATION NAME- TROPICAL WIND ENERGY CONVERSION AND REFERENCE LEVEL (TWERLE)

NSSDC ID- 75-052A-01 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI - P.	JULIAN	NATL CTR FOR ATMOS RES
OI - W.W.	KELLOGG	NATL CTR FOR ATMOS RES
OI - V.E.	SUOMI	U OF WISCONSIN
OI - C.R.	LAUGHLIN	NASA-GSFC
OI - R.L.	TALLEY	SIGMA DATA SERV CORP
OI - W.R.	BANDEEN	NASA-GSFC
OI - C.E.	COTE	NASA-GSFC

BRIEF DESCRIPTION

The goals of the Nimbus 6 Tropical Wind Energy Conversion And Reference Level Experiment (TWERLE) were closely associated with the objectives of the Global Atmospheric Research Program (GARP) and included (1) measuring upper atmospheric winds in the tropics, (2) studying the relative air motion along isobaric surfaces to determine the rate of conversion of atmospheric potential energy into kinetic energy, and (3) providing direct measurements of various meteorological parameters that served as reference points in adjusting indirect temperature soundings made from satellites. The experiment consisted of two basic components: (1) approximately 300 constant-level meteorological balloons to yield measurements of winds, temperature, and pressure in the tropics and at southern hemisphere midlatitudes at 150 mb (about 13.6-km altitude), and (2) the Nimbus 6 random access measurements system (RAMS) to provide data collection and location determinations from the balloons. The 3.5-m-diam polyester-mylar balloons were equipped with a transmitter-oscillator, solar power supply, digitizer/modulator, and sensors. The sensors consisted of a radio altimeter having an accuracy of better than plus or minus 20 m, a bead thermistor monitoring the ambient air temperature to an accuracy of 0.5 deg C, and a pressure sensor measuring the 150-mb flight altitude to an accuracy of 0.5 mb. A magnetic cutdown device was used to eliminate any accidental overflights into regions of the northern hemisphere north of 20 deg N latitude. The RAMS merely detected each balloon signal (401.2 MHz) and extracted the carrier frequency, balloon identification, and sensor data. This information, along with time references, was stored in digital form for subsequent relay to a ground acquisition station. The balloon's position and velocity were derived from the relative motion between the platform and the satellite by measuring Doppler shifts in the carrier signal received from the balloon. TWERLE was capable of a location accuracy of 5 km and a platform velocity accuracy of 1 m/s. For more detailed information, see Section 9 in "The Nimbus 6 User's Guide" (TRF B23261). For information concerning TWERLE data, contact Dr. Paul R. Julian, NCAR, P.O. Box 3000, Boulder, Colorado 80303. In addition to the TWERLE balloon experiment, many other experiments used RAMS. These experiments used ocean buoys to measure oceanographic and atmospheric parameters. Information about experiments can be obtained from principal investigators listed as Nimbus RAMS Experiments in the User's Guide and "The Nimbus 6 Data Catalog" (TRF B26731), both available from NSSDC.

------- NIMBUS 6, KYLE -------------------------------------

INVESTIGATION NAME- EARTH RADIATION BUDGET (ERB)

NSSDC ID- 75-052A-05 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
ATMOSPHERIC PHYSICS

PERSONNEL

PI - H.L.	KYLE	NASA-GSFC
PI - H.	JACOBOWITZ(FORMER)	NOAA-NESDIS
OI - A.J.	DRUMMOND(DECEASED)	EPPLEY LAB, INC
OI - I.	RUFF	NOAA-NESDIS
OI - J.R.	HICKEY	EPPLEY LAB, INC
OI - W.J.	SCHOLES	EPPLEY LAB, INC
OI - L.L.	STOWE	NOAA-NESDIS

BRIEF DESCRIPTION

The Nimbus 6 Earth Radiation Budget (ERB) experiment measured reflected and emitted terrestrial radiation fluxes in conjunction with solar radiation. The results were used (1) to determine the earth radiation budget, (2) to determine the angular distribution of terrestrial radiation for various meteorological and geographic regimes, and (3) to correlate measurements made using identical but independent channels calibrated to the same standard. Incoming solar radiation from 0.2 to 50 micrometers was normally monitored in 10 spectral intervals as the satellite orbited over the Antarctic, just before it started its northward trip on the daylight side of the earth. Terrestrial radiation measurements were taken continuously in the 0.2 to 4-micrometer, 0.7 to 3-micrometer, and 4 to 50-micrometer intervals. The measurements were taken in two ways. Four channels, using fixed wide-angle optics (133.3-deg field of view), measured the total outgoing radiation integrated over the entire disk of the earth. The second set of measurements was obtained for eight high-resolution narrow-angle scanning channels that measured the terrestrial radiation emanating from a relatively small area over a range of various zenith and azimuth angles. The multichannel radiometer employed a bi-axial scanning mechanism which enabled measurements to be obtained from the forward horizon to the aft horizon in a 64-s interval. Each axis of the scanning mechanism contained four shortwave channels (0.2 to 4.0 micrometers) and four longwave channels (4.0 to 50 micrometers) with a 0.25- by 5.14-deg field of view. The channels were oriented in a directional fan to cover 20 deg to each side of the orbital plane. The 64-s scan period allowed an area to be measured from up to 17 different angles as the spacecraft passed overhead. For a more detailed description, see Section 6 in "The Nimbus 6 User's Guide" (TRF B23261), available from NSSDC. A similar instrument was flown on Nimbus 5 and 7. The solar and wide-angle channels operated successfully and provided good quality data. The scanning channels developed mechanical scan problems in August 1975 and operated only in the nadir position after March 1976.

------- NIMBUS 6, WILHEIT, JR.-------------------------------

INVESTIGATION NAME- ELECTRICALLY SCANNING MICROWAVE RADIOMETER (ESMR)

NSSDC ID- 75-052A-03

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
OCEANOGRAPHY

PERSONNEL

PI - T.T.	WILHEIT, JR.	NASA-GSFC
OI - A.T.	EDGERTON	AEROJET ELECTROSYSTEMS

BRIEF DESCRIPTION

The Nimbus 6 Electrically Scanning Microwave Radiometer (ESMR) measured the earth's microwave emission to provide the liquid water content of clouds, the distribution and variation of sea ice cover, and gross characteristics of land surfaces (vegetation, soil moisture, and snow cover). The two-channel scanning radiometer operated in a 250-MHz band centered at 37 GHz. One channel was used to measure the vertical polarization and the other measured the horizontal polarization. The antenna beam array, a 90- by 20- by 12-cm box-like structure, was mounted on top of the spacecraft sensory ring and was pointed in the direction of the spacecraft's forward motion and tilted down 45 deg from the satellite antenna axis. The antenna beam scanned the earth in 71 discrete steps for various angles extending up to 35 deg on either side of the orbital plane. The deduced brightness temperatures were expected to be accurate to within 3-5 deg K. Spatial resolution was 20 km in the cross-track direction and 45 km in the direction parallel to the subpoint track. For a more detailed description, see Section 5 of "The Nimbus 6 User's Guide" (TRF B23261), available from NSSDC. The ESMR performance was satisfactory until September 15, 1976, when the horizontal channel output was zero due to a failure of the Ferrite-Dicke switch. Selected ESMR images were presented in "The Nimbus 6 Data Catalog" (TRF B26731), also available from NSSDC.

************************** NIMBUS 7**************************

SPACECRAFT COMMON NAME- NIMBUS 7
ALTERNATE NAMES- 11080, NIMBUS-G

NSSDC ID- 78-098A

LAUNCH DATE- 10/24/78 WEIGHT- 832. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 10/25/78
ORBIT PERIOD- 104.0 MIN	INCLINATION- 99.3 DEG
PERIAPSIS- 938. KM ALT	APOAPSIS- 953. KM ALT

PERSONNEL

MG - G.F.	ESENWEIN	NASA HEADQUARTERS
PM - C.M.	MACKENZIE	NASA-GSFC
PS - A.J.	FLEIG	NASA-GSFC

BRIEF DESCRIPTION

The Nimbus 7 research-and-development satellite served as a stabilized, earth-oriented platform for the testing of advanced systems for sensing and collecting data in the pollution, oceanographic and meteorological disciplines. The polar-orbiting spacecraft consisted of three major structures: (1) a hollow torus-shaped sensor mount, (2) solar paddles, and (3) a control housing unit that was connected to the sensor mount by a tripod truss structure. Configured somewhat like an ocean buoy, Nimbus 7 was nearly 3.04 m tall, 1.52 m in diameter at the base, and about 3.96 m wide with solar paddles extended. The sensor mount that formed the satellite base housed the electronics equipment and battery modules. The lower surface of the torus provided mounting space for sensors and antennas. A box-beam structure mounted within the center of the torus provided support for the larger sensor experiments. Mounted on the control housing unit, which was located on top of the spacecraft, were sun sensors, horizon scanners, and a command antenna. The spacecraft spin axis was pointed at the earth. An advanced attitude-control system permitted the spacecraft's orientation to be controlled to within plus or minus 1 deg in all three axes (pitch, roll, and yaw). Eight experiments were selected: (1) limb infrared monitoring of the stratosphere (LIMS), (2) stratospheric and mesospheric sounder (SAMS), (3) coastal-zone color scanner (CZCS), (4) stratospheric aerosol measurement II (SAM II), (5) earth radiation budget (ERB), (6) scanning multichannel microwave radiometer (SMMR), (7) solar backscatter UV and total ozone mapping spectrometer (SBUV/TOMS), and (8) temperature-humidity infrared radiometer (THIR). These sensors were capable of observing several parameters at and below the mesospheric levels. More details can be found in "The Nimbus 7 Users' Guide" (TRF B30045), available from NSSDC.

------- NIMBUS 7, GLOERSEN-------------------------------

INVESTIGATION NAME- SCANNING MULTISPECTRAL MICROWAVE RADIOMETER (SMMR)

NSSDC ID- 78-098A-08

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
OCEANOGRAPHY

PERSONNEL

TL - P.	GLOERSEN	NASA-GSFC
TM - R.O.	RAMSEIR	SURVEILLANCE SAT PROJ
TM - D.H.	STAELIN	MASS INST OF TECH
TM - W.J.	CAMPBELL	US GEOLOGICAL SURVEY
TM - D.B.	ROSS	NOAA-ERL
TM - P.	GUDMANSEN	TECH U OF DENMARK
TM - F.T.	BARATH	NASA-JPL
TM - T.T.	WILHEIT, JR.	NASA-GSFC
TM - J.C.	ALISHOUSE	NOAA-NESDIS
TM - D.J.	CAVALIERI	NASA-GSFC
TM - A.	CHANG	NASA-GSFC
TM - O.M.	JOHANNESSEN	US NAVAL POST GRAD SCH
TM - K.	KATSAROS	U OF WASHINGTON
TM - K.	KUNZI	U OF BERNE
TM - E.	LANGHAM	RADARSAT PROJ OFFICE
TM - E.P.L.	WINDSOR	BRITISH AIR CORP, LTD

BRIEF DESCRIPTION

The primary purpose of the Scanning Multichannel Microwave Radiometer (SMMR) was to obtain sea surface temperature and near-surface winds under all-weather conditions for developing and testing global ocean circulation models and other aspects of ocean dynamics. Winds, water vapor, liquid-water content, mean cloud droplet size, rainfall rate and sea ice parameters were also determined. Microwave brightness temperatures were observed with a 10-channel (five-frequency dual polarized) scanning radiometer operating at frequencies of 37, 21, 18, 10.69, and 6.6 GHz. Six Dicke-type radiometers were utilized. Those operating at the four longest wavelengths measured alternate polarizations during successive scans of the antenna; the others operated continuously for each polarization. The antenna was a parabolic reflector offset from the nadir by 42 deg. Motion of the antenna reflector provided observations from within a conical volume along the ground track of the spacecraft. The same instrument was flown on SEASAT 1. For a complete description, see Section 8 in "The Nimbus 7 Users' Guide" (TRF B30045), available from NSSDC.

------- NIMBUS 7, HEATH-------------------------------

INVESTIGATION NAME- SOLAR BACKSCATTER ULTRAVIOLET/TOTAL OZONE MAPPING SPECTROMETER (SBUV/TOMS)

NSSDC ID- 78-098A-09

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
UPPER ATMOSPHERE RESEARCH

PERSONNEL

TL - D.F.	HEATH	NASA-GSFC
TM - C.L.	MATEER	ENVIRONMENT CANADA
TM - A.D.	BELMONT	CONTROL DATA CORP
TM - A.J.	MILLER	NOAA-NMC
TM - A.E.S.	GREEN	U OF FLORIDA
TM - D.M.	CUNNOLD	GEORGIA INST OF TECH
TM - W.L.	IMHOF	LOCKHEED PALO ALTO
TM - A.J.	KRUEGER	NASA-GSFC
TM - P.K.	BHARTIA	SYST & APPL SCI CORP
TM - A.J.	FLEIG	NASA-GSFC
TM - V.G.	KAVEESHWAR	SYST & APPL SCI CORP
TM - K.F.	KLENK	SYST & APPL SCI CORP
TM - R.	MCPETERS	NASA-GSFC
TM - H.W.	PARK	SYST & APPL SCI CORP

BRIEF DESCRIPTION

The objectives of the Solar Backscatter Ultraviolet and Total Ozone Mapping Spectrometer (SBUV/TOMS) were to determine the vertical distribution of ozone, map the total ozone content, and monitor the incident solar ultraviolet (UV) irradiance and ultraviolet radiation backscattered from the earth. The SBUV consisted of a double Ebert-Fastie spectrometer and a filter photometer similar to BUV on Nimbus 4. The SBUV spectrometer measured solar UV backscattered by the earth's atmosphere at 12 wavelengths between 0.25 and 0.34 micrometer, with a spectral bandpass of .001 micrometer. The instrument field of view (FOV) of 0.20 rad was directed at nadir. Both channels also viewed the sun for calibration through the use of a diffuser plate deployed near the terminator. The contribution functions for the eight shortest wavelengths were centered at levels ranging from 55 to 28 km and were used to infer the vertical ozone profile. The four longest wavelengths had contribution functions in the troposphere which were used to compute the total ozone amount. The SBUV spectrometer had a second mode of operation that allowed a continuous spectral scan from 0.16 to 0.4 micrometer for detailed examination of the extraterrestrial solar spectrum and its temporal variations. A parallel photometer channel at 0.343 micrometer measured the reflectivity of the atmosphere's

lower boundary in the same 0.21-rad FOV. The TOMS was a single Ebert-Fastie spectrometer with a fixed grating and an array of exit slits. The TOMS step-scanned across the orbital track 51 deg from the nadir in 3-deg steps with an FOV of approximately 0.052 rad. At each scan position, the earth radiance was monitored at six wavelengths between 0.31 and 0.38 micrometer (3125 and 3800 A) to infer the total ozone amount. The signal-to-noise ratio of the SBUV was greater than 5.E3. The TOMS signal-to-noise ratio was greater than 1.E5. For a more detailed description, see Section 7 in "The Nimbus 7 Users' Guide" (TRF B30045), available from NSSDC.

------- NIMBUS 7, HOVIS--

INVESTIGATION NAME- COASTAL ZONE COLOR SCANNER (CZCS)

NSSDC ID- 78-098A-03 INVESTIGATIVE PROGRAM
CODE EE APPLICATIONS

INVESTIGATION DISCIPLINE(S)
OCEANOGRAPHY
EARTH RESOURCES SURVEY

PERSONNEL

TL - W.A.	HOVIS	NOAA-NESDIS
TM - C.S.	YENTSCH	BIGELOW LAB OCEAN SCI
TM - D.	CLARK	NOAA-NESDIS
TM - J.R.	APEL	APPLIED PHYSICS LAB
TM - S.Z.	EL-SAYED	TEXAS A+M
TM - H.R.	GORDON	NOAA-PMEL
TM - R.C.	WRIGLEY	NASA-ARC
TM - F.P.	ANDERSON	NATL RES INST OCEANOL
TM - R.	AUSTIN	SCRIPPS INST OCEANOGR
TM - E.	BAKER	NOAA-PMEL
TM - J.	MUELLER	US NAVAL POST GRAD SCH
TM - B.	STURM	EUROPE JCR

BRIEF DESCRIPTION

The Coastal Zone Color Scanner Experiment (CZCS) was designed to map chlorophyll concentration in water, sediment distribution, gelbstoffe concentrations as a salinity indicator, and temperature of coastal waters and ocean currents. Reflected solar energy was measured in six channels to sense color caused by absorption due to chlorophyll, sediments, and gelbstoffe in coastal waters. Spectral bands at 0.443 and 0.670 micrometers centered on the most intense absorption bands of chlorophyll, while the band at 0.550 micrometers centered on the "hinge point," the wavelength of minimum absorption. Ratios of measured energies in these channels were shown to closely parallel surface chlorophyll concentrations. Data from the scanning radiometer were processed, with algorithms developed from the field experiment data, to produce maps of chlorophyll absorption. The temperatures of coastal waters and ocean currents were measured in a spectral band centered at 11.5 micrometers. Observations were made also in two other spectral bands, 0.520 micrometers for chlorophyll correlation and 0.750 micrometers for surface vegetation. To avoid sun glint, the scanner mirror was tilted about the sensor pitch axis on command so that the line of sight of the sensor was moved in 2-deg increments up to 20 deg with respect to the nadir. The scan width was 1556 km centered on nadir and the ground resolution was 0.825 km at nadir. For a more detailed description, see Section 2 in "The Nimbus 7 Users' Guide" (TRF B30045), available from NSSDC. Data are archived at SDSD. Since mid-1984, the instrument experienced occasional start-up problems.

------- NIMBUS 7, KYLE--

INVESTIGATION NAME- EARTH RADIATION BUDGET (ERB)

NSSDC ID- 78-098A-07 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
ATMOSPHERIC PHYSICS

PERSONNEL

TL - H.L.	KYLE	NASA-GSFC
TL - H.	JACOBOWITZ(FORMER)	NOAA-NESDIS
TM - T.H.	VONDERHAAR	COLORADO STATE U
TM - F.B.	HOUSE	DREXEL U
TM - K.L.	COULSON	U OF CALIF, DAVIS
TM - J.R.	HICKEY	EPPLEY LAB, INC
TM - L.L.	STOWE	NOAA-NESDIS
TM - A.P.	INGERSOLL	CALIF INST OF TECH
TM - G.L.	SMITH	NASA-LARC
TM - A.	ARKING	NASA-GSFC
TM - G.	CAMPBELL	COLORADO STATE U
TM - R.	MASCHHOFF	GULTON INDUSTRIES,INC.

BRIEF DESCRIPTION

The objective of the Earth Radiation Budget (ERB) experiment, a continuation of Nimbus 6 ERB, was to determine, over a period of a year, the earth radiation budget on both synoptic and planetary scales by simultaneous measurements of incoming solar radiation and outgoing earth-reflected (shortwave) and emitted (longwave) radiation. Both (1) fixed wide-angle sampling of terrestrial fluxes at the satellite altitude and (2) scanned narrow-angle sampling of the radiance components, which were dependent on angle, were used to determine outgoing radiation (reflected and emitted). The ERB subsystem consisted of a 22-channel radiometer containing separate subassemblies to perform the required solar, earth-flux (wide angle), and scanned earth radiance (narrow angle) measurements. The systems used optical filters for spectral discriminations, as well as uncooled thermal detectors, thermopile detectors in the solar and fixed-earth-flux channels, and pyroelectric detectors in the scanning channels. The 10 solar channels viewed in front of the observatory in the X-Y plane. The solar channels obtained usable solar data only during a period of about 3 min in each orbit when the spacecraft was over the Antarctic region. Their full response field of view (FOV) was 0.18 rad. The solar channel subassembly was pivoted plus or minus 0.35 rad in the X-Y plane to compensate for sun-angle deviation when required. The four earth-flux channels were mounted so that they could continuously view the total earth disk, and they were continuously sampled at a rate of four times per second. Demodulator output signals were integrated for periods of at least 3.8 s. There were eight narrow FOV channels (four shortwave and four longwave) mounted in the scanning head. The head was gimbal-mounted in the radiometer unit main frame. The FOVs of the telescopes were asymmetric (4.4 by 89.4 mrad) and those of the shortwave and longwave channels were coincident. The 89.4 mrad FOVs of the four pairs of channels were not contiguous, but covered only alternate 89.4 mrad angular intervals along the horizon. For a more detailed description, see Section 3 in "The Nimbus 7 Users' Guide" (TRF B30045), available from NSSDC. The narrow-view scanner failed in June 1980.

------- NIMBUS 7, MCCORMICK--

INVESTIGATION NAME- STRATOSPHERIC AEROSOL MEASUREMENT-II (SAM-II)

NSSDC ID- 78-098A-06 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
UPPER ATMOSPHERE RESEARCH
METEOROLOGY
ATMOSPHERIC PHYSICS

PERSONNEL

TL - M.P.	MCCORMICK	NASA-LARC
TM - T.J.	PEPIN	U OF WYOMING
TM - G.W.	GRAMS	GEORGIA INST OF TECH
TM - B.M.	HERMAN	U OF ARIZONA
TM - P.B.	RUSSELL	NASA-ARC

BRIEF DESCRIPTION

The objective of the Stratospheric Aerosol Measurement (SAM II) experiment was to provide vertical distribution of stratospheric aerosols in the polar regions of both hemispheres. When no clouds were present in the instantaneous field of view (IFOV), the tropospheric aerosols could also be mapped. The instrument, basically a sun photometer, measured the extinction of solar radiation at 1.0-micrometer wavelength during spacecraft sunrise and sunset. The photometer viewed a portion of the solar disk with a 0.145-mrad IFOV and a sampling rate of 50 samples per second. As the spacecraft first viewed the sunrise, the photometer-pointing axis was depressed approximately 0.52 rad with respect to the spacecraft horizontal. The photometer continued looking at the sun until its depression angle was on the order of 0.44 rad (approximately 1.4 min observing time). Before sunset, the photometer head rotated 3.14 rad in azimuth and viewed the sun from a depression of approximately 0.44 to 0.52 rad as the spacecraft orbited to the dark side of the earth. The extinction measurements were inverted for the number density times the aerosol scattering cross section by using the Lambert-Beer Law and assuming the atmosphere to be composed of layers. To determine the stratospheric aerosol optical properties, ground-truth and in situ balloon-borne aerosol measurements were also made. For more detailed information, see Section 5 in "The Nimbus 7 Users' Guide" (TRF B30045), available from NSSDC.

------- NIMBUS 7, STOWE--

INVESTIGATION NAME- TEMPERATURE/HUMIDITY INFRARED RADIOMETER (THIR)

NSSDC ID- 78-098A-10 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI - L.L.	STOWE	NOAA-NESDIS
OI - L.J.	ALLISON(RETIRED)	NASA-GSFC
OI - P.H.	HWANG	NASA-GSFC
OI - K.F.	FLENK	SYST & APPL SCI CORP
OI - P.K.	BHARTIA	SYST & APPL SCI CORP

BRIEF DESCRIPTION

The Nimbus 7 Temperature-Humidity Infrared Radiometer (THIR) detected emitted thermal radiation in both the 10.5- to 12.5-micrometer region (IR window) and the 6.5- to 7.0-micrometer region (water vapor). The window channel provided an image of the cloud cover and temperatures of the cloud tops, land, and ocean surfaces. The other channel provided information on the moisture and cirrus cloud content of the upper troposphere and stratosphere, and the location of

jet streams and frontal systems. The ground resolution at nadir was 6.7 km for the window channel and 20 km for the water vapor channel. Data from these two channels were used primarily to support other sophisticated meteorological experiments onboard Nimbus 7. The instrument was a non-imaging radiometer consisting of a 12.7-cm Cassegrain system and scanning mirror common to both channels, a beam splitter, filters, and two germanium-immersed thermistor bolometers. Incoming radiant energy was collected by a flat scanning mirror inclined at 45 deg to the optical axis. The mirror rotated through 360 deg at 48 rpm and scanned in a plane normal to the spacecraft velocity. The energy then was focused on a dichroic beam splitter which divided the energy spectrally and spatially. The two channels of this sensor transformed the received radiation into electric outputs (voltages), which were digitized and recorded on magnetic tape for subsequent playback to a ground acquisition station. For a more complete information on instrument and data products, see Section 9 in "The Nimbus 7 Users' Guide" (TRF B30045) and the "Nimbus 7 Temperature-Humidity Infrared Radiometer (THIR) Data User's Guide" (TRF B30601), both available from NSSDC. Except for data being digitized on board, the Nimbus 7 THIR was of the same design and operation as the THIR flown on Nimbus 4, 5, and 6.

------- NIMBUS 7, TAYLOR---

INVESTIGATION NAME- STRATOSPHERIC AND MESOSPHERIC SOUNDER (SAMS)

NSSDC ID- 78-098A-02

INVESTIGATIVE PROGRAM
CODE EE/CO-OP. APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
UPPER ATMOSPHERE RESEARCH

PERSONNEL

PI - F.W.	TAYLOR	OXFORD U
OI - G.D.	PESKETT	OXFORD U
OI - C.D.	RODGERS	OXFORD U
OI - E.J.	WILLIAMSON	OXFORD U
OI - J.J.	BARNETT	OXFORD U
OI - M.	CORNEY	OXFORD U
OI - R.L.	JONES	OXFORD U
OI - J.G.	WHITNEY	OXFORD U

BRIEF DESCRIPTION

The objective of the Stratospheric and Mesospheric Sounder (SAMS) was to observe emission from the limb of the atmosphere through various pressure-modulator radiometers in order to determine temperature and vertical concentrations of H2O, N2O, CH4, CO, and NO in the stratosphere and mesosphere. Measurements of zonal wind in this region were attempted by observing the Doppler shift of atmospheric emission lines. Radiation from the limb of the atmosphere was incident on a telescope of 15-cm aperture. In front of the telescope, a plane mirror scanned the limb, viewed space for calibration, and viewed the atmosphere obliquely to obtain vertical profiles. Three adjacent fields of view, each 28 by 2.8 mrad (corresponding to 100 km by 10 km at the limb), focused onto a field-splitting mirror which directed radiation to six detectors. The remaining division into channels was accomplished through dichroic beam splitters. There were seven pressure modulator cells (PMC), two containing CO2, the remainder N2O, NO, CH4, CO, H2O. Pressure in the cells could be varied on command by changing the temperature of a small container of molecular sieve material attached to each PMC. The spectral parameters for the H20 channel were 2.7 micrometers and 25 to 100 micrometers. All other channels lay within the range 4.1 to 15 micrometers. Within the telescope, a chopper operating at 250 Hz allowed measurement of two separate signals from all detectors, one at 250 Hz and one at the PMC frequency. Comparison of these signals permitted eliminating the emission from interfering gases within a particular spectral interval. In front of the chopper, a small black body at known temperature could be introduced for calibration. Accurate measurement of the atmospheric pressure at the level being viewed was obtained from the two signals from one CO2 channel. For a more detailed description, see Section 6 in "The Nimbus 7 Users' Guide" (TRF B30045), available from NSSDC.

.... NOAA 6 ....

SPACECRAFT COMMON NAME- NOAA 6
ALTERNATE NAMES- NOAA-A, 11416

NSSDC ID- 79-057A

LAUNCH DATE- 06/27/79 WEIGHT- 588.9 KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 06/28/79
ORBIT PERIOD- 101.5 MIN	INCLINATION- 98.7 DEG
PERIAPSIS- 833. KM ALT	APOAPSIS- 833. KM ALT

PERSONNEL

MG - R.J.	ARNOLD	NASA HEADQUARTERS
PM - G.W.	LONGANECKER	NASA-GSFC

BRIEF DESCRIPTION

NOAA 6 was an operational meteorological satellite for use in the National Operational Environmental Satellite System (NOESS) and for the support of the Global Atmospheric Research Program (GARP) during 1978-84. The satellite design provided an economical and stable sun-synchronous platform for advanced operational instruments to measure the earth's atmosphere, its surface and cloud cover, and the near-space environment. Primary sensors included an advanced very high resolution radiometer (AVHRR) and a TIROS operational vertical sounder (TOVS). Secondary experiments consisted of a space environment monitor (SEM) and a data collection and platform location system (DCPLS). The satellite was based upon the Block 5D spacecraft bus developed for the U.S. Air Force, and it was capable of maintaining an earth-pointing accuracy of better than plus or minus 0.1 deg with a motion rate of less than 0.035 deg/s. In early 1984, only one to two NOAA 6 passes were taken per day due to priorities for NOAA 7 and 8 data. However, when NOAA 8 failed in late June 1984, NOAA 6 was returned to full operational status to continue to provide morning orbit operational data.

------- NOAA 6, LEINBACH---

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR (SEM)

NSSDC ID- 79-057A-04

INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - H.	LEINBACH	NOAA-ERL
PI - H.H.	SAUER	NOAA-ERL
PI - D.S.	EVANS	NOAA-ERL

BRIEF DESCRIPTION

The Space Environmental Monitor (SEM) was an extension of the solar proton monitoring experiment flown on the ITOS spacecraft series. The object was to measure proton flux, electron flux density, and energy spectrum in the upper atmosphere. The experiment package consisted of three detector systems and a data processing unit. The medium energy proton and electron detector (MEPE[illegible] measured protons in five energy ranges from 30 keV to >2[illegible] MeV; electrons above 30, 100, and 300 keV; protons and electrons (inseparable) above 6 MeV; and omni-directional protons above 16, 36, and 80 MeV. The high-energy proton alpha telescope (HEPAT), which had a 48-deg viewing cone, viewed in the anti-earth direction and measured protons in four energy ranges above 370 MeV and alpha particles in two energy ranges above 850 MeV/nucleon. The total energy detector (TED) measured electrons and protons between 300 eV and 20 keV.

------- NOAA 6, NESDIS STAFF---

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- 79-057A-01

INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI -	NESDIS STAFF	NOAA-NESDIS

BRIEF DESCRIPTION

The NOAA 6 Advanced Very High Resolution Radiometer (AVHRR) was a four-channel scanning radiometer capable of providing global daytime and nighttime sea-surface temperature and information about ice, snow, and clouds. These data were obtained on a daily basis for use in weather analysis and forecasting. The multispectral radiometer operated in the scanning mode and measured emitted and reflected radiation in the following spectral intervals: channel 1 (visible), 0.55 to 0.9 micrometer; channel 2 (near IR), 0.725 micrometer to detector cutoff around 1.1 micrometers; channel 3 (IR window), 3.55 to 3.93 micrometers; and channel 4 (IR window), 10.5 to 11.5 micrometers. All four channels had a spatial resolution of 1.1 km, and the two IR-window channels had a thermal resolution of 0.12 deg K at 300 deg K. The AVHRR was capable of operating in both real-time or recorded modes. Real-time or direct readout data were transmitted to ground stations both at low (4-km) resolution via automatic picture transmission (APT) and at high (1-km) resolution via high-resolution picture transmission (HRPT). Data recorded on board were available for processing in the NOAA central computer facility. They included global area coverage (GAC) data, with a resolution of 4 km, and local area coverage (LAC), that contained data from selected portions of each orbit with a 1-km resolution. Identical experiments were flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA 6, NESDIS STAFF-------------------------------------

INVESTIGATION NAME- TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)

NSSDC ID- 79-057A-02 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION
The TIROS Operational Vertical Sounder (TOVS) consisted of three instruments: the high-resolution infrared radiation sounder modification 2 (HIRS/2), the stratospheric sounding unit (SSU), and the microwave sounding unit (MSU). All three instruments were designed to determine radiances needed to calculate temperature and humidity profiles of the atmosphere from the surface to the stratosphere (approximately 1 mb). The HIRS/2 instrument had 20 channels in the following spectral intervals: channels 1 through 5 , the 15-micrometer CO2 bands (15.0, 14.7, 14.5, 14.2, and 14.0 micrometers); channels 6 and 7, the 13.7- and 13.4-micrometer CO2/H2O bands; channel 8, the 11.1-micrometer window region; channel 9, the 9.7-micrometer ozone band; channels 10, 11, and 12, the 6-micrometer water vapor bands (8.3, 7.3, and 6.7 micrometers); channels 13 and 14, the 4.57- and 4.52-micrometer N2O bands; channels 15 and 16, the 4.46- and 4.40-micrometer CO2/N2O bands; channel 17, the 4.24-micrometer CO2 band; channels 18 and 19, the 4.0- and 3.7-micrometer window bands; and channel 20, the 0.70-micrometer visible region. The SSU instrument was provided by the British Meteorological Office. It was similar to the pressure-modulated radiometer (PMR) flown on Nimbus 6. The SSU operated at three 15.0-micrometer channels using selective absorption, passing the incoming radiation through three pressure-modulated cells containing CO2. The MSU instrument was similar to the scanning microwave spectrometer (SCAMS) flown on Nimbus 6. The MSU had one channel in the 50.31-GHz window region and three channels in the 55-GHz oxygen band (53.73, 54.96, and 57.95 GHz) to obtain temperature profiles which were free of cloud interference. The HIRS/2 had a field of view (FOV) 30 km in diameter at nadir, whereas the MSU had a FOV of 110 km in diameter. The HIRS/2 sampled 56 FOVs in each scan line about 2250 km wide, and the MSU sampled 11 FOVs along the swath with the same width. Each SSU scan line had 8 FOVs with a width of 1500 km. This experiment was also flown on other TIROS-N/NOAA series spacecraft. For a more detailed description, see W. L. Smith, "The TIROS-N operational vertical sounder," Bull. Am. Meteorol. Soc., v. 60, pp. 1177-1187, 1979. Archival data are available from the Satellite Data Services Division, National Climatic Center, NOAA, Washington, D.C.

------- NOAA 6, NESDIS STAFF-------------------------------------

INVESTIGATION NAME- DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCLS)

NSSDC ID- 79-057A-03 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION
The Data Collection and Platform Location System (DCPLS) on NOAA 6, also known as ARGOS, was designed and built in France to meet the meteorological data needs of the United States and to support the Global Atmospheric Research Program (GARP). The system received low-duty-cycle transmissions of meteorological observations from free-floating balloons, ocean buoys, other satellites, and fixed ground-based sensor platforms distributed around the globe. These observations were organized on board the spacecraft and retransmitted when the spacecraft came within range of a command and data acquisition (CDA) station. For free-moving balloons, the Doppler frequency shift of the transmitted signal was observed to calculate the location of the balloons. The DCLS was expected, for a moving sensor platform, to have a location accuracy of 3 to 5 km rms, and a velocity accuracy of 1 to 1.6 m/s. This system had the capability of acquiring data from up to 4000 platforms per day. Identical experiments were flown on other spacecraft in the TIROS-N/NOAA series. Processing and dissemination of data were handled by CNES in Toulouse, France.

.... NOAA 7............................

SPACECRAFT COMMON NAME- NOAA 7
ALTERNATE NAMES- NOAA-C, 12553

NSSDC ID- 81-059A

LAUNCH DATE- 06/23/81 WEIGHT- 588.9 KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 06/24/81
ORBIT PERIOD- 102. MIN INCLINATION- 98.9 DEG
PERIAPSIS- 845. KM ALT APOAPSIS- 863. KM ALT

PERSONNEL
MG - R.J. ARNOLD NASA HEADQUARTERS
PM - G.W. LONGANECKER NASA-GSFC
PS - J. SUSSKIND NASA-GSFC

BRIEF DESCRIPTION
NOAA 7 was an operational meteorological satellite for use in the National Operational Environmental Satellite System (NOESS) and for the support of the Global Atmospheric Research Program (GARP) during 1978-84. The satellite design provided an economical and stable sun-synchronous platform for advanced operational instruments to measure the earth's atmosphere, its surface and cloud cover, and the near-space environment. Primary sensors included an advanced very high resolution radiometer (AVHRR) and a TIROS operational vertical sounder (TOVS). Secondary experiments consisted of a space environment monitor (SEM) and a data collection and platform location system (DCPLS). A contamination monitor was provided by USAF to assess contamination sources, levels, and effects for consideration on future spacecraft. The satellite was based upon the Block 5D spacecraft bus developed for the U.S. Air Force, and it was capable of maintaining an earth-pointing accuracy of better than plus or minus 0.1 deg with a motion rate of less than 0.035 deg/s. For a more detailed description, see A. Schwalb, "The TIROS-N/NOAA A-G Satellite Series," NOAA Tech. Mem. NESS 95, 1978.

------- NOAA 7, LEINBACH-------------------------------------

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR (SEM)

NSSDC ID- 81-059A-04 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL
PI - D.S. EVANS NOAA-ERL

BRIEF DESCRIPTION
The Space Environmental Monitor (SEM) experiment was an extension of the solar-proton monitoring experiment flown on the ITOS spacecraft series. The objective was to measure proton flux, electron flux density, and energy spectrum in the upper atmosphere. The experiment package consisted of three detector systems and a data processing unit. The medium energy proton and electron detector (MEPED) measured protons in five energy ranges from 30 keV to >2.5 MeV; electrons above 30, 100, and 300 keV; protons and electrons (inseparable) above 6 MeV; and omni-directional protons above 16, 36, and 80 MeV. The high-energy proton and alpha telescope (HEPAT), which had a 48-deg viewing cone, viewed in the anti-earth direction, and measured protons in four energy ranges above 370 MeV and alpha particles in two energy ranges above 850 MeV/nucleon. The total energy detector (TED) measured electrons and protons between 300 eV and 20 keV.

------- NOAA 7, NESDIS STAFF-------------------------------------

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- 81-059A-01 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION
The NOAA 7 Advanced Very High Resolution Radiometer (AVHRR) was a five-channel scanning radiometer capable of providing global daytime and nighttime sea-surface temperature and information about ice, snow, and clouds. These data were obtained on a daily basis for use in weather analysis and forecasting. The multispectral radiometer operated in the scanning mode and measured emitted and reflected radiation in the following spectral intervals: channel 1 (visible), 0.55 to 0.9 micrometer; channel 2 (near IR), 0.725 micrometer to detector cutoff around 1.1 micrometers; channel 3 (IR window), 3.55 to 3.93 micrometers; channel 4 (IR window), 10.5 to 11.5 micrometers; and channel 5 (IR window), 11.5 to 12.5 micrometers. All five channels had a spatial resolution of 1.1 km, and the three IR-window channels had a thermal resolution of 0.12 deg K at 300 deg K. The AVHRR was capable of operating

in both real-time or recorded modes. Real-time or direct readout data were transmitted to ground stations both at low (4-km) resolution via automatic picture transmission (APT) and at high (1-km) resolution via high-resolution picture transmission (HRPT). Data recorded on board were available for processing in the NOAA central computer facility. They included global area coverage (GAC) data, with a resolution of 4 km, and local area coverage (LAC), that contained data from selected portions of each orbit with a 1-km resolution. Identical experiments were flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA 7, NESDIS STAFF------------------------------------

INVESTIGATION NAME- TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)

NSSDC ID- 81-059A-02 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION

The TIROS Operational Vertical Sounder (TOVS) consisted of three instruments: the high-resolution infrared radiation sounder modification 2 (HIRS/2), the stratospheric sounding unit (SSU), and the microwave sounding unit (MSU). All three instruments were designed to determine radiances needed to calculate temperature and humidity profiles of the atmosphere from the surface to the stratosphere (approximately 1 mb). The HIRS/2 instrument had 20 channels in the following spectral intervals: channels 1 through 5 , the 15-micrometer CO2 bands (15.0, 14.7, 14.5, 14.2, and 14.0 micrometers); channels 6 and 7, the 13.7- and 13.4-micrometer CO2/H2O bands; channel 8, the 11.1-micrometer window region; channel 9, the 9.7-micrometer ozone band; channels 10, 11, and 12, the 6-micrometer water vapor bands (8.3, 7.3, and 6.7 micrometers); channels 13 and 14, the 4.57- and 4.52-micrometer N2O bands; channels 15 and 16, the 4.46- and 4.40-micrometer CO2/N2O bands; channel 17, the 4.24-micrometer CO2 band; channels 18 and 19, the 4.0- and 3.7-micrometer window bands; and channel 20, the 0.70-micrometer visible region. The SSU instrument was provided by the British Meteorological Office. It was similar to the pressure-modulated radiometer (PMR) flown on Nimbus 6. The SSU operated at three 15.0-micrometer channels using selective absorption, passing the incoming radiation through three pressure-modulated cells containing CO2. The MSU instrument was similar to the scanning microwave spectrometer (SCAMS) flown on Nimbus 6. The MSU had one channel in the 50.31-GHz window region and three channels in the 55-GHz oxygen band (53.73, 54.96, and 57.95 GHz) to obtain temperature profiles which were free of cloud interference. The HIRS/2 had a field of view (FOV) 30 km in diameter at nadir, whereas the MSU had a FOV of 110 km in diameter. The HIRS/2 sampled 56 FOVs in each scan line about 2250 km wide, and the MSU sampled 11 FOVs along the swath with the same width. Each SSU scan line had 8 FOVs with a width of 1500 km. This experiment was also flown on other TIROS-N/NOAA series spacecraft. For a more detailed description, see W. L. Smith, "The TIROS-N operational vertical sounder," Bull. Am. Meteorol. Soc., v. 60, pp. 1177-1187, 1979. Archival data are available from the Satellite Data Services Division, National Climatic Center, NOAA, Washington, D.C.

------- NOAA 7, NESDIS STAFF------------------------------------

INVESTIGATION NAME- DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCLS)

NSSDC ID- 81-059A-03 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
COMMUNICATIONS

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION

The Data Collection and Platform Location System (DCPLS) on NOAA 7, also known as ARGOS, was designed and built in France to meet the meteorological data needs of the United States and to support the Global Atmospheric Research Program (GARP). The system received low-duty-cycle transmissions of meteorological observations from free-floating balloons, ocean buoys, other satellites, and fixed ground-based sensor platforms distributed around the globe. These observations were organized on board the spacecraft and retransmitted when the spacecraft came within range of a command and data acquisition (CDA) station. For free-moving sensor platforms, the Doppler frequency shift of the transmitted signal was observed to calculate the location with a location accuracy of 3 to 5 km rms, and a velocity accuracy of 1 to 1.6 m/s. This system had the capability of acquiring data from as many as 4000 platforms per day. Identical experiments were flown on other spacecraft in the TIROS-N/NOAA series. Processing and dissemination of data were handled by CNES in Toulouse, France.

****************************** NOAA 8 ******************************

SPACECRAFT COMMON NAME- NOAA 8
ALTERNATE NAMES- 13923, NOAA-E

NSSDC ID- 83-022A

LAUNCH DATE- 03/28/83 WEIGHT- 1030. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 03/29/83
ORBIT PERIOD- 101.2 MIN INCLINATION- 98.8 DEG
PERIAPSIS- 806. KM ALT APOAPSIS- 829. KM ALT

PERSONNEL
MG - J.R. GREAVES NASA HEADQUARTERS
PM - G.W. LONGANECKER NASA-GSFC
PS - J. SUSSKIND NASA-GSFC

BRIEF DESCRIPTION

NOAA 8 was a third-generation operational meteorological satellite for use in the National Environmental Satellite Data and Information Service (NESDIS) of NOAA. NOAA 8 was the first spacecraft of the advanced TIROS-N (ATN) series. The satellite design provided an economical and stable sun-synchronous platform for advanced operational instruments to measure the earth's atmosphere, its surface and cloud cover, and the near-space environment. Primary sensors included an advanced very high resolution radiometer (AVHRR) and a TIROS operational vertical sounder (TOVS). Secondary experiments consisted of a space environment monitor (SEM) and a data collection and platform location system (DCPLS). A search and rescue satellite aided tracking (SARSAT) system was also included on NOAA 8. The satellite was based upon the Block 5D spacecraft bus developed for the U.S. Air Force, and it was capable of maintaining an earth-pointing accuracy of better than plus or minus 0.1 deg with a motion rate of less than 0.035 deg/s. Although designed for a 2-year life span, NOAA 8 experienced a premature failure in June 1984.

------- NOAA 8, LEINBACH------------------------------------

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR (SEM)

NSSDC ID- 83-022A-04 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL
PI - D.S. EVANS NOAA-ERL

BRIEF DESCRIPTION

The Space Environmental Monitor (SEM) experiment was an extension of the solar-proton monitoring experiment flown on the ITOS spacecraft series. The objective was to measure proton flux, electron flux density, and energy spectrum in the upper atmosphere. The experiment package consisted of three detector systems and a data processing unit. The medium energy proton and electron detector (MEPED) measured protons in five energy ranges from 30 keV to >2.5 MeV; electrons above 30, 100, and 300 keV; protons and electrons (inseparable) above 6 MeV; and omni-directional protons above 16, 36, and 80 MeV. The high-energy proton and alpha telescope (HEPAT), which had a 48-deg viewing cone, viewed in the anti-earth direction, and measured protons in four energy ranges above 370 MeV and alpha particles in two energy ranges above 850 MeV/nucleon. The total energy detector (TED) measured electrons and protons between 300 eV and 20 keV.

------- NOAA 8, NESDIS STAFF------------------------------------

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- 83-022A-01 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION

The NOAA 8 Advanced Very High Resolution Radiometer (AVHRR) was a four-channel scanning radiometer capable of providing global daytime and nighttime sea surface temperatures and information about ice, snow, and clouds. These data were obtained on a daily basis for use in weather analysis and forecasting. The multispectral radiometer operated in the scanning mode and measured emitted and reflected radiation in the following spectral intervals: channel 1 (visible), 0.55 to 0.9 micrometer; channel 2 (near-IR), 0.725 micrometer to

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detector cutoff around 1.1 micrometers; channel 3 (IR window), 10.5 to 11.5 micrometers; and channel 4 (IR window), 3.55 to 3.93 micrometers. All four channels had a spatial resolution of 1.1 km, and the two IR window channels had a thermal resolution of 0.12 deg K at 300 deg K. The AVHRR was capable of operating in both real-time or recorded modes. Real-time or direct readout data were transmitted to ground stations both at low (4-km) resolution via automatic picture transmission (APT), and at high (1-km) resolution via high-resolution picture transmission (HRPT). Data recorded on board were available for processing in the NOAA central computer facility. They included global area coverage (GAC) data (4-km resolution) and local area coverage (LAC) data from selected portions of each orbit (1-km resolution). The same experiments are flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA 8, NESDIS STAFF-----------------------------------

INVESTIGATION NAME- TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)

NSSDC ID- 83-022A-02 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION

The TIROS Operational Vertical Sounder (TOVS) on NOAA-8 consisted of three instruments: the high-resolution infrared radiation sounder modification 2 (HIRS/2), the stratospheric sounding unit (SSU), and the microwave sounding unit (MSU). All three instruments were designed to determine radiances needed to calculate temperature and humidity profiles of the atmosphere from the surface to the stratosphere (approximately 1 mb). The HIRS/2 instrument had 20 channels in the following spectral intervals: channels 1 through 5, the 15-micrometer CO2 bands (15.0, 14.7, 14.5, 14.2, and 14.0 micrometers); channels 6 and 7, the 13.7- and 13.4-micrometer CO2/H2O bands; channel 8, the 11.1-micrometer window region; channel 9, the 9.7-micrometer ozone band; channels 10, 11, and 12, the 6-micrometer water vapor bands (12.55, 7.3, and 6.7 micrometers); channels 13 and 14, the 4.57- and 4.52-micrometer N2O bands; channels 15 and 16, the 4.46- and 4.40-micrometer CO2/N2O bands; channels 17, 18 and 19, the 4.25-, 4.0- and 3.7-micrometer window bands; and channel 20, the 0.7-micrometer visible region. Resolution for all channels was 17.4 km at nadir. The HIRS/2 instrument provided data for calculations of temperature profiles from the surface to 10 mb, water vapor content at three levels of the atmosphere, and total ozone content. The second instrument, the SSU, was provided by United Kingdom. It had three channels that operated at 15.0 micrometers with three pressure-modulated cells containing CO2 to accomplish selective bandpass filtration of the sampled radiance. The third instrument, the MSU, had four channels operating in the 50- to 60-GHz oxygen band (50.31, 53.73, 54.96 and 57.95 GHz) to obtain temperature profiles which were free of cloud interference.

------- NOAA 8, NESDIS STAFF-----------------------------------

INVESTIGATION NAME- DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCLS)

NSSDC ID- 83-022A-03 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION

The Data Collection and Platform Location System (DCPLS) on NOAA 8, also known as ARGOS, was designed and built in France to meet the meteorological data needs of the United States and to support the Global Atmospheric Research Program (GARP). The system received low-duty-cycle transmissions of meteorological observations from free-floating balloons, ocean buoys, other satellites, and fixed ground-based sensor platforms distributed around the globe. These observations were organized on board the spacecraft and retransmitted when the spacecraft came in range of a command and data acquisition (CDA) station. For free-moving balloons, the Doppler frequency shift of the transmitted signal was observed to calculate the location of the balloons. The DCLS was expected, for a moving sensor platform, to have a location accuracy of 5 to 8 km rms, and a velocity accuracy of 1 to 1.6 m/s. This system had the capability of acquiring data from as many as 2000 platforms per day. The same experiments were flown on other spacecraft in the TIROS-N/NOAA series. Processing and dissemination of data were handled by CNES in Toulouse, France.

------- NOAA 8, NESDIS STAFF-----------------------------------

INVESTIGATION NAME- SEARCH AND RESCUE SATELLITE AIDED TRACKING (SARSAT)

NSSDC ID- 83-022A-05 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION

The Search and Rescue Satellite Aided Tracking (SARSAT) instruments had the capability of detecting and locating existing emergency transmitters in a manner independent of the environmental data. Data from the 121.5-MHz emergency locator transmitters (ELT), the 243-MHz emergency position indicating radio beacons (EPIRB), and experimental 406-MHz ELTs/EPIRBs were received by the search and rescue repeater (SARR) and broadcast in real time on an L-band frequency (1544.5 MHz). Real-time data were monitored by local user terminals operated in the United States, Canada, and France. The 406-MHz data were also processed by the search and rescue processor (SARP) and retransmitted in real time and stored on the spacecraft for later transmittal to the CDA stations in Alaska and Virginia, thus providing full global coverage. The distress signals were forwarded to Mission Control Centers located in each country for subsequent relay to the appropriate Rescue Coordination Center.

**************************** NOAA 9 ****************************

SPACECRAFT COMMON NAME- NOAA 9
ALTERNATE NAMES- NOAA-F

NSSDC ID- 84-123A

LAUNCH DATE- 12/12/84 WEIGHT- 1030. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 12/12/84
ORBIT PERIOD- 102. MIN INCLINATION- 98.9 DEG
PERIAPSIS- 841. KM ALT APOAPSIS- 862. KM ALT

PERSONNEL
MG - J.R. GREAVES NASA HEADQUARTERS
PM - G.W. LONGANECKER NASA-GSFC
PS - J. SUSSKIND NASA-GSFC

BRIEF DESCRIPTION

NOAA 9 was a third-generation operational meteorological satellite. The satellite design provided an economical and stable sun-synchronous platform for advanced operational instruments to measure the earth's atmosphere, its surface and cloud cover, and the near-space environment. Primary sensors included (1) an advanced very high resolution radiometer (AVHRR), (2) a TIROS operational vertical sounder (TOVS), (3) an earth radiation budget experiment (ERBE), and (4) a solar backscattered ultraviolet radiometer (SBUV/2). The secondary experiment was a data collection and platform location system (DCPLS). A search and rescue satellite aided tracking (SARSAT) system was also carried on NOAA 9. The satellite was based upon the Block 5D spacecraft bus developed for the U.S. Air Force, and was capable of maintaining an earth-pointing accuracy of better than plus or minus 0.1 deg with a motion rate of less than 0.035 deg/s.

------- NOAA 9, BROOME---

INVESTIGATION NAME- EARTH RADIATION BUDGET EXPERIMENT (ERBE)

NSSDC ID- 84-123A-05 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
ATMOSPHERIC PHYSICS

PERSONNEL
TL - G.C. BROOME NASA-LARC
TM - A.A. RUDMANN NASA-GSFC

BRIEF DESCRIPTION

The Earth Radiation Budget Experiment (ERBE) was designed to measure the energy exchange between the earth-atmosphere system and space. The measurements of global, zonal, and regional radiation budgets on monthly time scales helped in climate prediction and in the development of statistical relationships between regional weather and radiation budget anomalies. The ERBE consisted of two instrument packages: the non-scanner (ERBE-NS) instrument and the scanner (ERBS-S) instrument. The ERBE-NS instrument had five sensors, each using cavity radiometer detectors. Four of them were primarily earth-viewing: two wide field-of-view (FOV) sensors viewed the

entire disk of the earth from limb to limb, approximately 135 deg; two medium FOV sensors viewed a 10-deg region. The fifth sensor was a solar monitor that measured the total radiation from the sun. Of the four earth-viewing sensors, one wide and one medium FOV sensors made total radiation measurements; the other two measured reflected solar radiation in the shortwave spectral band between 0.2 and 5 micrometers by using Suprasil-W filters. The earth-emitted longwave radiation component was determined by subtracting the shortwave measurement from the total measurement. The ERBE-S instrument was a scanning radiometer which contained three narrow FOV channels. One channel measured reflected solar radiation in the shortwave spectral interval between 0.2 and 5 micrometers. Another channel measured earth-emitted radiation in the longwave spectral region from 5 to 50 micrometers. The third channel measured total radiation with wavelength between 0.2 and 50 micrometers. All three channels were located within a continuously rotating scan drum which scaned the FOV across track sequentially from horizon to horizon. Each channel made 74 radiometric measurements during each scan, and the FOV of each channel was 3 by 4.5 deg that covered about 40 km at the earth's surface. The ERBE-S also viewed the sun for calibration. Additional information can be obtained from "Earth Radiation Budget Experiment (ERBE): An Overview", J. Energy, v. 6, pp. 141-146 (1982), by B. R. Barkstrom and J. B. Hall, Jr.

------- NOAA 9, CUNNINGHAM---------------------------------------

INVESTIGATION NAME- SOLAR BACKSCATTER ULTRAVIOLET RADIOMETER, SBUV/2

NSSDC ID- 84-123A-07 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL
TL - F.G. CUNNINGHAM NASA-GSFC
TM - D.F. HEATH NASA-GSFC

BRIEF DESCRIPTION
The Solar Backscatter Ultraviolet Radiometer (SBUV/2) was designed to map total ozone concentrations on a global scale, and to provide the vertical distribution of ozone in the earth's atmosphere. The instrument design was based upon the technology developed for the SBUV/TOMS flown on Nimbus 7. The SBUV/2 instrument measured backscattered solar radiation in an 11.3-deg field of view in the nadir direction at 12 discrete, 1.1-nm wide, wavelength bands between 252.0 and 339.8 nm. The solar irradiance was determined at the same 12 wavelength bands by deploying a diffuser which reflected sunlight into the instrument's field of view. The SBUV/2 also measured the solar irradiance or the atmospheric radiance with a continuous spectral scan from 160 to 400 nm in increments of 0.148 nm. The SBUV/2 had another narrowband filter photometer channel, called the cloud cover radiometer (CCR), which continuously measured the earth's surface brightness at 380 nm. The CCR field of view was 11.3 deg.

------- NOAA 9, NESDIS STAFF---------------------------------------

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- 84-123A-01 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION
The NOAA 9 Advanced Very High Resolution Radiometer (AVHRR) was a five-channel scanning radiometer capable of providing global daytime and nighttime sea surface temperature and information about ice, snow, and clouds. These data were obtained on a daily basis for use in weather analysis and forecasting. The multispectral radiometer operated in the scanning mode and measured emitted and reflected radiation in the following spectral intervals: channel 1 (visible), 0.55 to 0.9 micrometer; channel 2 (near-IR), 0.725 micrometer to detector cutoff around 1.1 micrometers; channel 3 (IR window), 10.5 to 11.5 micrometers; channel 4 (IR window), 3.55 to 3.93 micrometers; and channel 5, 11.5 to 12.5 micrometers. All five channels had a spatial resolution of 1.1 km, and the two IR-window channels had a thermal resolution of 0.12 deg K at 300 deg K. The AVHRR was capable of operating in both real-time and recorded modes. Real-time or direct readout data were transmitted to ground stations both at low (4-km) resolution via APT and at high (1-km) resolution via high-resolution picture transmission (HRPT). Data recorded on board were available for processing in the NOAA central computer facility. They included global area coverage (GAC) data, which had a resolution of 4 km, and local area coverage (LAC) data, which contained data from selected portions of each orbit with a 1-km resolution. The same experiments were flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA 9, NESDIS STAFF---------------------------------------

INVESTIGATION NAME- TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)

NSSDC ID- 84-123A-02 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION
The TIROS Operational Vertical Sounder (TOVS) on NOAA 9 consisted of three instruments: the high-resolution infrared radiation sounder modification 2 (HIRS/2), the stratospheric sounding unit (SSU), and the microwave sounding unit (MSU). All three instruments were designed to determine radiances needed to calculate temperature and humidity profiles of the atmosphere from the surface to the stratosphere (approximately 1 mb). The HIRS/2 instrument had 20 channels in the following spectral intervals: channels 1 through 5, the 15-micrometer CO2 bands (15.0, 14.7, 14.5, 14.2, and 14.0 micrometers); channels 6 and 7, the 13.7- and 13.4-micrometer CO2/H2O bands; channel 8, the 11.1-micrometer window region; channel 9, the 9.7-micrometer ozone band; channels 10 through 12, the 6-micrometer water vapor bands (12.55, 7.3, and 6.7 micrometers); channels 13 and 14, the 4.57- and 4.52-micrometer N2O bands; channels 15 and 16, the 4.46- and 4.40-micrometer CO2/N2O bands; channels 17, 18 and 19, the 4.25-, 4.0- and 3.7-micrometer window bands; and channel 20, the 0.7-micrometer visible region. Resolution for all channels was 17.4 km at nadir. The HIRS/2 instrument provided data for calculations of temperature profiles from the surface to 10 mb, water vapor content at three levels of the atmosphere, and total ozone content. The second instrument, the SSU, was provided by the United Kingdom. It had three channels that operated at 15.0 micrometers with three pressure-modulated cells containing CO2 to accomplish selective bandpass filtration of the sampled radiance. The third instrument, the MSU, had four channels operating in the 50- to 60-GHz oxygen band (50.31, 53.73, 54.96 and 57.95 GHz) to obtain temperature profiles which were free of cloud interference.

------- NOAA 9, NESDIS STAFF---------------------------------------

INVESTIGATION NAME- DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCLS)

NSSDC ID- 84-123A-03 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION
The Data Collection and Platform Location System (DCPLS) on NOAA 9, also known as ARGOS, was designed and built in France to meet the meteorological data needs of the United States. The system received low-duty-cycle transmissions of meteorological observations from free-floating balloons, ocean buoys, other satellites, and fixed ground-based sensor platforms distributed around the globe. These observations were organized on board the spacecraft and retransmitted when the spacecraft came within range of a command and data acquisition (CDA) station. For free-moving balloons, the Doppler frequency shift of the transmitted signal was observed to calculate the location of the balloons. The DCLS was expected, for a moving sensor platform, to have a location accuracy of 5 to 8 km rms, and a velocity accuracy of 1 to 1.6 m/s. This system had the capability of acquiring data from as many as 2000 platforms per day. Identical experiments were flown on other spacecraft in the TIROS-N/NOAA series. Processing and dissemination of data were handled by CNES of Toulouse, France.

------- NOAA 9, NESDIS STAFF---------------------------------------

INVESTIGATION NAME- SEARCH AND RESCUE SATELLITE AIDED TRACKING (SARSAT)

NSSDC ID- 84-123A-06 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION
The Search and Rescue Satellite Aided Tracking (SARSAT) instruments had the capability of detecting and locating existing emergency transmitters in a manner independent of the environmental data. Data from the 121.5-MHz emergency locator transmitters (ELT), the 243-MHz emergency position indicating radio beacons (EPIRB), and the experimental 406-MHz ELTs/EPIRBs were received by the search and rescue repeater (SARR) and broadcasted in real time on an L-band frequency (1544.5 MHz).

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Real-time data were monitored by local user terminals operated in the United States, Canada, and France. The 406-MHz data were also processed by a search and rescue processor (SARP) and stored on the spacecraft for later transmittal to the CDA stations in Alaska and Virginia, thus providing full global coverage. The distress signals were forwarded to Mission Control Centers located in each country for subsequent relay to the appropriate Rescue Coordination Center.

************************** OHZORA **************************

SPACECRAFT COMMON NAME- OHZORA
ALTERNATE NAMES- EXOSPHERIC SAT. C, EXOS-C
14722

NSSDC ID- 84-015A

LAUNCH DATE- 02/14/84 WEIGHT- 210. KG
LAUNCH SITE- KAGOSHIMA SPACE CENTER, JAPAN
LAUNCH VEHICLE- M-3S

SPONSORING COUNTRY/AGENCY
JAPAN ISAS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 02/15/84
ORBIT PERIOD- 96.9 MIN INCLINATION- 74.6 DEG
PERIAPSIS- 354. KM ALT APOAPSIS- 865. KM ALT

PERSONNEL

PM - T.	ITOH	ISAS
PS - H.	OYA	U OF TOHOKU
PS - T.	OGAWA	ISAS

BRIEF DESCRIPTION
The purpose of this mission was to perform remote sensing of the minor constituents of the middle atmosphere and to study the wave-particle interactions in the ionospheric plasma in the South American anomaly and the auroral zones. This mission is part of the Middle Atmosphere Program (MAP).

------- OHZORA, DOKE -------

INVESTIGATION NAME- MONITOR OF HIGH ENERGY PARTICLES

NSSDC ID- 84-015A-08 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - T.	DOKE	WASEDA U
OI - H.	MURAKAMI	RIKKYO U
OI - K.	NAGATA	TAMAGAWA U

BRIEF DESCRIPTION
The objective of this experiment was to monitor the energy spectra and flux of electrons, protons and alpha particles with energies greater than 50 keV using solid-state detectors.

------- OHZORA, MAKINO -------

INVESTIGATION NAME- LIMB SCANNING IR RADIOMETER

NSSDC ID- 84-015A-01 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL

PI - T.	MAKINO	RIKKYO U
OI - H.	YAMAMOTO	RIKKYO U
OI - H.	SEKIGUCHI	RIKKYO U

BRIEF DESCRIPTION
This investigation used a limb scanning radiometer to measure the 1.27-micrometer atmospheric band to deduce the ozone density in the 70- to 90-km altitude range.

------- OHZORA, MATSUZAKI -------

INVESTIGATION NAME- INFRARED SOLAR SPECTROMETER

NSSDC ID- 84-015A-03 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL

PI - A.	MATSUZAKI	ISAS
OI - Y.	NAKAMURA	ISAS
OI - T.	ITOH	ISAS

BRIEF DESCRIPTION
This investigation used an infrared spectrometer to measure the limb absorption of the solar spectrum to obtain profiles of stratospheric water vapor, methane, carbon dioxide, and nitrous oxide.

------- OHZORA, MUKAI -------

INVESTIGATION NAME- PRECIPITATING PARTICLE ENERGY ANALYZER

NSSDC ID- 84-015A-04 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - T.	MUKAI	ISAS
OI - H.	KUBO	ISAS
OI - T.	ITOH	ISAS
OI - K.	HIRAO	ISAS
OI - N.	KAYA	KOBE U
OI - H.	MATSUMOTO	KOBE U

BRIEF DESCRIPTION
The purpose of this experiment was to measure the energy spectrum of precipitating electrons and protons with electrostatic analyzers.

------- OHZORA, OGAWA -------

INVESTIGATION NAME- ULTRAVIOLET SPECTROMETER

NSSDC ID- 84-015A-02 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL

PI - T.	OGAWA	ISAS
OI - K.	SUZUKI	ISAS
OI - N.	IWAGAMI	ISAS

BRIEF DESCRIPTION
This investigation involved the measurement of backscattered ultraviolet (2500-3500 A) to obtain profiles of the ozone density in the 25- to 60-km altitude range.

------- OHZORA, OYA -------

INVESTIGATION NAME- TOPSIDE PLASMA SOUNDER

NSSDC ID- 84-015A-06 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - H.	OYA	U OF TOHOKU
OI - A.	MORIOKA	U OF TOHOKU
OI - T.	YOSHINO	U OF ELECTRO-COMMUN

BRIEF DESCRIPTION
This experiment used a topside sounder with a receiver that could measure ionospheric electron density profiles, radio waves emanating from the planets and the higher harmonic emissions from terrestrial electric power lines.

------- OHZORA, TAKAGI -------

INVESTIGATION NAME- SOLAR IMAGE-RADIOMETER

NSSDC ID- 84-015A-05 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL

PI - M.	TAKAGI	NAGOYA U
OI - Y.	KONDO	NAGOYA U

BRIEF DESCRIPTION
This investigation used a solar image radiometer in several visible and near-infrared bands to measure the limb absorption of the solar spectrum to obtain vertical profiles of stratospheric aerosols and ozone.

------- OHZORA, TAKAHASHI -------

INVESTIGATION NAME- PLASMA PROBES

NSSDC ID- 84-015A-07 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - T. TAKAHASHI U OF TOHOKU
OI - H. OYA U OF TOHOKU
OI - K. HIRAO ISAS
OI - K. OYAMA ISAS

BRIEF DESCRIPTION

This experiment used plasma probes to measure electron density and electron temperature.

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SPACECRAFT COMMON NAME- PIONEER 10
ALTERNATE NAMES- PIONEER-F, PL-723D
05860

NSSDC ID- 72-012A

LAUNCH DATE- 03/03/72 WEIGHT- 231. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- JUPITER FLYBY

PERSONNEL

MG - E. MONTOYA NASA HEADQUARTERS
SC - A.G. OPP NASA HEADQUARTERS
PM - R.O. FIMMEL NASA-ARC
PS - P. DYAL NASA-ARC

BRIEF DESCRIPTION

This mission was the first to be sent to the outer solar system, and after encountering the planet Jupiter it assumed an escape trajectory from the solar system. The spacecraft body was mounted behind a 2.74-m-diameter parabolic dish antenna that was 46 cm deep. The spacecraft structure was a 36-cm-deep flat equipment compartment, the top and bottom being regular hexagons. Its sides were 71 cm long. One side joined a smaller compartment that carried the scientific experiments. The high-gain antenna feed was situated on three struts, which projected forward about 1.2 m. This feed was topped with a medium-gain antenna. A low-gain omnidirectional antenna extended about 0.76 m behind the equipment compartment and was mounted below the high-gain antenna. Power for the spacecraft was obtained by four SNAP-19 radioisotope thermonuclear generators (RTG), which were held about 3 m from the center of the spacecraft by two three-rod trusses 120 deg apart. A third boom extended 6.6 m from the experiment compartment to hold the magnetometer away from the spacecraft. The four RTG's generated about 155 W at launch and decayed to approximately 140 W by the time the spacecraft reached Jupiter on December 3, 1973, 21 months after launch. There were three reference sensors: a star sensor for Canopus, and two sun sensors. Attitude position could be calculated from the reference directions to the earth and the sun, with the known direction to Canopus as a backup. Three pairs of rocket thrusters provided spin-rate control (maintained at 4.8 rpm) and changed the velocity of the spacecraft. These thrusters could be pulsed or fired steadily by command. Communications were maintained via (1) the omnidirectional and medium-gain antennas which operated together while connected to one receiver and (2) the high-gain antenna which was connected to another receiver. These receivers could be interchanged by command to provide some redundancy. Two radio transmitters, coupled to two traveling-wave tube amplifiers, produced 8 W at 2292 MHz each. Uplink was accomplished at 2110 MHz, while data transmission downlink was at 2292 MHz. The data were received by NASA's Deep Space Network. The spacecraft was temperature-controlled between minus 23 deg C and plus 38 deg C. Fifteen experiments were carried to study the interplanetary and planetary magnetic fields; solar wind parameters; cosmic rays; transition region of the heliosphere; neutral hydrogen abundance; distribution, size, mass, flux, and velocity of dust particles; Jovian aurorae; Jovian radio waves; atmosphere of Jupiter and some of its satellites, particularly Io; and to photograph Jupiter and its satellites. Instruments carried for these experiments were magnetometer, plasma analyzer, charged particle detector, ionizing detector, non-imaging telescopes with overlapping fields of view to detect sunlight reflected from passing meteoroids, sealed pressurized cells of argon and nitrogen gas for measuring the penetration of meteoroids, UV photometer, IR radiometer, and an imaging photopolarimeter, which produced photographs and measured polarization. Further scientific information was obtained from the tracking and occultation data. The spacecraft achieved its closest approach to Jupiter on December 3, 1973, when it reached approximately three Jovian radii (about 210,000 km). The spacecraft contains plaques that have drawings depicting a man, a woman, and the location of the sun and the earth in our galaxy. It has left the solar system and passed into interstellar space.

------- PIONEER 10, ANDERSON--------------------------------------

INVESTIGATION NAME- CELESTIAL MECHANICS

NSSDC ID- 72-012A-09 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
PLANETOLOGY
CELESTIAL MECHANICS

PERSONNEL

PI - J.D. ANDERSON NASA-JPL
OI - G.W. NULL NASA-JPL

BRIEF DESCRIPTION

In this investigation, carried on both Pioneers 10 and 11, two-way Doppler tracking of the spacecraft was used to make more precise determinations of planetary masses, the heliocentric orbit of Jupiter, and the gravitational fields of the sun, Jupiter, and the Galilean satellites.

------- PIONEER 10, BARNES--------------------------------------

INVESTIGATION NAME- QUADRISPHERICAL PLASMA ANALYZER

NSSDC ID- 72-012A-13 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI - A. BARNES NASA-ARC
OI - L.A. FRANK U OF IOWA
OI - R. LUEST ESA
OI - D.S. INTRILIGATOR CARMEL RESEARCH CENTER
OI - D.D. MCKIBBIN NASA-ARC
OI - V.T. ZAVIENTSEFF(NLA) NASA-ARC
OI - F.L. SCARF TRW SYSTEMS GROUP
OI - H.R. COLLARD NASA-ARC
OI - W.C. FELDMAN LOS ALAMOS NAT LAB
OI - Z.A. SMITH NOAA-SEL

BRIEF DESCRIPTION

The instrument consisted of dual 90-deg quadraspherical electrostatic analyzers, one with 26 individual particle detectors and the other with 5 current collectors. The system was capable of measuring incident plasma distribution parameters over the energy range 0.1 to 18 keV for protons and approximately 1-500 eV for electrons. The high-resolution analyzer, with a constant of 9 keV/Q per kV applied to the plates, had a mean plate radius of 9 cm and separation of 0.5 cm. This analyzer which was used to measure ions only and had 26 channeltrons mounted on the semicircular exit to the analyzer. The aperture pointed through a wide slit in the back of the spacecraft high-gain antenna reflector and pointed along the spin axis toward the earth (and therefore the sun). The edges of the antenna reflector limited the viewing of the instrument to 73 deg with respect to the spin axis. The channeltrons covered a range of plus or minus 51 deg. Each channeltron near the center covered 3 deg, and approximately 8 deg near the edges of the analyzer. The angular width perpendicular to the long angular width was about 2 deg. In one half the spin period, the whole cone of half-angle 51 deg, centered on the sun, was swept out. A medium-energy analyzer with a mean radius of 12 cm and a 1-cm plate separation (constant of 6 keV/Q per kV applied) was used to detect both ions and electrons. The detectors were five flat-surface current collectors. The three center collectors each covered 15 deg and covered the angular range of plus or minus 22.5 deg from the spin axis. The two outside collectors had an angular width of 47.5 deg and were located at plus or minus 46.25 deg from the center of the analyzer. There were a variety of possible operating modes for the experiment; however, the principal mode utilized during the encounter phase was one in which the analyzer plate potential was stepped through its range every one-half revolution of the spacecraft, and all current collectors or channeltrons were read out at the peak flux roll angle. The high- and medium-resolution analyzers operated independently, so that a cross-check between these analyzers was possible. The dynamic range for the particle fluxes was from 1.0E+2 to 3.0E+9/(sq cm-s) and the proton temperature could be ascertained down to 2.0E+3 deg K.

------- PIONEER 10, FILLIUS--------------------------------------

INVESTIGATION NAME- JOVIAN TRAPPED RADIATION

NSSDC ID- 72-012A-05 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - R.W. FILLIUS U.OF CALIF, SAN DIEGO
OI - C.E. MCILWAIN U OF CALIF, SAN DIEGO

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BRIEF DESCRIPTION

This experiment consisted of an array of five particle detectors with electron thresholds in the range .01 to 35 MeV and proton thresholds in the range 0.15 to 80 MeV. A Cerenkov counter (C) had four output channels (C1, C2, C3, and CDC) sensitive to electrons having energies above 6, 9, 13, and 1 MeV, respectively. An electron-scatter counter (E) had three output channels (E1, E2, and E3) sensitive to electrons above .16, .26, and .46 MeV. A minimum ionization counter (M) had three output channels, M1 sensitive to electrons having energies greater than 35 MeV, M2 that measured background, and M3 that was sensitive to protons having energies greater than 80 MeV. The last two sensors were scintillator detectors (SP and SE), both of which had energy thresholds of 10 keV for electrons and 150 keV for protons. The sensitivity of the SE detector to protons was about a factor of 10 lower than its sensitivity to electrons. Thus, the SEDC channel effectively measured the electron flux, which could then be subtracted from the SPDC channel response to obtain the proton flux. Several other channels, listed above, required corrections to obtain the fluxes of the species indicated. Three of the channels (CDC, SPDC, and SEDC) were read out through a common electrometer. Due to a malfunction that occurred between launch and Jovian encounter, these three channels produced no usable encounter data. The detector channels could be programmed for readout in any one of four patterns at each of the eight spacecraft bit rate modes. During encounter when the spacecraft was operating in the highest bit rate mode, the minimum time to sample one channel was 1.5 s and the time to obtain a complete scan through all channels was 108 s. Since the directional detectors pointed perpendicular to the spin axis and the spin rate was 5 rpm, pitch-angle measurements were obtained. While the experiment was primarily designated for encounter studies, some data were obtained at low rates in interplanetary space. A description of the instrumentation and initial results was published in J. Geophys. Res., v. 79, p. 3589, 1974.

------- PIONEER 10, GEHRELS-------------------------------------

INVESTIGATION NAME- IMAGING PHOTOPOLARIMETER (IPP)

NSSDC ID- 72-012A-07 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
PLANETARY ATMOSPHERES

PERSONNEL

PI - T.	GEHRELS	U OF ARIZONA
OI - D.L.	COFFEEN	NASA-GISS
OI - J.	HAMEEN-ANTTILA	U OF ARIZONA
OI - C.E.	KENKNIGHT	U OF ARIZONA
OI - R.F.	HUMMER	SANTA BARBARA RES CTR
OI - M.G.	TOMASKO	U OF ARIZONA
OI - W.	SWINDELL	U OF ARIZONA

BRIEF DESCRIPTION

The Imaging Photopolarimeter (IPP) experiment (also on Pioneer 11) used during Jovian encounter made simultaneous, two-color (blue - 3900 to 4900 A, red - 5800 to 7000 A) polarimetric and radiometric measurements, and moderate-resolution (about 200 km at best) spin-scan images of Jupiter and the Jovian satellites. The polarimetric and radiometric work was performed using an 8- by 8-mrad field-stop aperture, while the spin-scan imaging used a 0.5- by 0.5-mrad aperture stop. Relative radiometric calibration was derived using an internal tungsten lamp. Long-term absolute calibration of the instrument was accomplished by means of a sunlight diffuser/attenuator element located in the spacecraft antenna structure. Primary radiometric calibration was obtained throughout the mission by periodically commanding the telescope to view this diffuse backlighted (sunlight) source. The experimental train for the IPP package consisted of the following elements: (1) a near-diffraction-limited 2.54-cm Maksutov catadioptric telescope of focal ratio f/3.4, (2) a focal-plane wheel containing field-of-view (FOV) apertures, depolarizers, calibration source, etc., (3) a Wollaston prism to split light into two orthogonally polarized beams, (4) a 45-deg dichromatic mirror that reflected wavelengths shorter than 5500 A (blue beam) and transmitted all light of greater wavelength (red beam), (5) for each spectral beam (two polarizations) a filtering-coated relay lens and folding mirrors, and (6) for each spectral beam, two Bendix Channeltron detectors (blue bialkili S-11 photocathodes and red S-20 photocathodes) to register the intensity in each polarization component. Polarization data also include the interplanetary region.

------- PIONEER 10, JUDGE-------------------------------------

INVESTIGATION NAME- ULTRAVIOLET PHOTOMETRY

NSSDC ID- 72-012A-06 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
PLANETARY ATMOSPHERES

PERSONNEL

PI - D.L.	JUDGE	U OF SOUTHERN CALIF
OI - R.W.	CARLSON	NASA-JPL

BRIEF DESCRIPTION

This experiment (on both Pioneers 10 and 11) consisted of a broadband photometer sensitive between 200 and 800 A. During the cruise phase of the mission, this experiment was used to search for the supersonic-to-subsonic transition region in the solar wind. During the Jovian encounter, this experiment was used to look for evidence of an auroral oval on the Jovian dayside, to find the ratio of hydrogen to helium in the Jovian atmosphere, and to find the temperature of the outer portion of the Jovian atmosphere. Evidence of helium was found in the interplanetary region indicating interactions between charged particles and neutral hydrogen.

------- PIONEER 10, KLIORE-------------------------------------

INVESTIGATION NAME- S-BAND OCCULTATION

NSSDC ID- 72-012A-10 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.J.	KLIORE	NASA-JPL
OI - G.	FJELDBO(NLA)	NASA-JPL
OI - D.L.	CAIN	NASA-JPL
OI - B.L.	SEIDEL	NASA-JPL
OI - S.I.	RASOOL	IBM

BRIEF DESCRIPTION

This experiment, carried on both Pioneers 10 and 11, utilized the S-band (2292 MHz, 8 W) spacecraft radio transmitter signal characteristics to obtain information about the ionospheres and atmospheres of Jupiter and its satellite Io. Entrance into and exit from Jupiter and Io occultation provided changes in the signal characteristics from which atmospheric temperature, pressure, and electron density profiles could be calculated. Temperature and pressure profiles were limited to levels above the pressure of one earth atmosphere. Signal occultation also provided a determination of the planetary diameter.

------- PIONEER 10, MCDONALD-------------------------------------

INVESTIGATION NAME- COSMIC-RAY SPECTRA

NSSDC ID- 72-012A-12 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL

PI - F.B.	MCDONALD	NASA HEADQUARTERS
OI - K.G.	MCCRACKEN	CSIRO
OI - W.R.	WEBBER	U OF NEW HAMPSHIRE
OI - E.C.	ROELOF	APPLIED PHYSICS LAB
OI - J.H.	TRAINOR	NASA-GSFC
OI - B.J.	TEEGARDEN	NASA-GSFC

BRIEF DESCRIPTION

This experiment consisted of three multi-element solid-state telescopes, all looking normal to the spacecraft spin axis. The high-energy telescope (HET) consisted of five collinear sensors, and measured stopping particles (Z = 1 to 8) in the energy range 20 to 50 MeV/nucleon and penetrating particles in the range 50 to 800 MeV/nucleon. Charge resolution for penetrating particles was possible up to 200 MeV/nucleon. The first low-energy telescope (LET-I) had four elements and measured stopping (Z = 1 to 8) particles in the energy range 3 to 32 MeV/nucleon. The second low-energy telescope (LET-II) had three elements and measured stopping electrons between 50 and 1000 keV and stopping protons between 50 keV and 20 MeV. For each telescope, count rates were obtained for each of several sensor coincidence-anticoincidence modes. Some of the rates from each telescope were sectored into eight octants in the spacecraft spin plane. In addition, three-sensor pulse-height analysis, with priority schemes favoring the analysis of heavier particles, was associated with each telescope.

------- PIONEER 10, SIMPSON-------------------------------------

INVESTIGATION NAME- CHARGED PARTICLE COMPOSITION

NSSDC ID- 72-012A-02 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL
PI - J.A. SIMPSON U OF CHICAGO
OI - J.J. O'GALLAGHER U OF MARYLAND
OI - A. TUZZOLINO U OF CHICAGO

BRIEF DESCRIPTION

This experiment (carried also on Pioneer 11) measured charged-particle composition and spectra using four detector systems: (1) the main telescope, consisting of seven elements and providing energy spectra (approximately 3 to 68 MeV for protons and 10 to 150 MeV/nucleon for oxygen), element resolution (through oxygen), and isotope resolution (for H and He); (2) the low-energy subsystem telescope, consisting of two elements and using a very small thin first element to extend the high-sensitivity proton measurements below 1 MeV (0.3 to 9 MeV) in the presence of a high gamma-ray background aboard the spacecraft; (3) the electron-current detector (ECG), consisting of a beryllium-shield silicon detector operated in current mode to measure high fluxes of electrons with energies above 3 MeV; and (4) the fission cell detector, recording fission fragments from the nucleon-induced fission of thorium 232 sandwiched between two large-area silicon detectors to measure fluxes of protons (above 30 MeV) in the presence of high fluxes of electrons. The experiment sample time was synchronized with the spacecraft spin, permitting sectoring of the readout of the main and low-energy telescopes into eight octants about the spin axis. Data also include the interplanetary region.

------- PIONEER 10, VAN ALLEN----------------------------------

INVESTIGATION NAME- JOVIAN CHARGED PARTICLES

NSSDC ID- 72-012A-11 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - J.A. VAN ALLEN U OF IOWA

BRIEF DESCRIPTION

This experiment used seven miniature Geiger tubes in three arrays to measure proton and electron fluxes in interplanetary space and in the vicinity of Jupiter. Detector groupings were as follows: (1) a three-element (A, B, and C) differentially shielded telescope, with tube C shielded omnidirectionally and used for background subtraction to provide directional rates such as A-C (5-21 MeV electrons and 30-77.5 MeV protons) and B-C (0.55-21 MeV electrons and 6.6-77.5 MeV protons), (2) a three-element (D, E, and F) triangular array, each element responding to electrons above 31 MeV and protons above 77.5 MeV, and (3) a thin-window tube (G) with a gold-plated elbow as the aperture which admitted scattered electrons above 0.06 MeV while discriminating strongly against protons. Single element and coincidence rates were telemetered from the first two telescopes. The telemetry bit rate prevailing during the Jupiter encounter permitted directional sampling in intervals of about 14 deg of roll about the spin axis. For further details, see Baker and Van Allen, J. Geophys. Res., v. 81, p. 617, 1976.

*************************** PIONEER 11 ***********************

SPACECRAFT COMMON NAME- PIONEER 11
ALTERNATE NAMES- PIONEER-G, PL-733C
6421

NSSDC ID- 73-019A

LAUNCH DATE- 04/06/73 WEIGHT- 231. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- SATURN FLYBY

PERSONNEL
MG - E. MONTOYA NASA HEADQUARTERS
SC - A.G. OPP NASA HEADQUARTERS
PM - R.O. FIMMEL NASA-ARC
PS - P. DYAL NASA-ARC

BRIEF DESCRIPTION

This was the second mission to investigate Jupiter and the outer solar system. Pioneer 11, like Pioneer 10, used Jupiter's gravitational field to alter its trajectory radically. It passed close to Saturn and then it followed an escape trajectory from the solar system. The spacecraft was 2.9 m long and contained a 2.74-m diameter high-gain antenna of aluminum honeycomb sandwich material whose feed was topped with a medium-gain antenna. A low-gain, omnidirectional antenna was mounted below the high-gain dish. The spacecraft contained two nuclear electric-power generators, which generated 144 W at Jupiter, but decreased to 100 W at Saturn. There were three reference sensors: a star (Canopus) sensor, and two sun sensors. Attitude position could be calculated from the reference direction to the earth and the sun, with the known direction to Canopus as backup. Pioneer 11's star sensor gain and threshold settings were modified, based on experience gained from the settings used on Pioneer 10. Three pairs of rocket thrusters provided spin-axis control (maintained at 4.8 rpm) and change of the spacecraft velocity. The thrusters could be either fired steadily or pulsed, by command. Communications were maintained via the omnidirectional and medium-gain antennas, which operated together, connected to one receiver, while the high-gain antenna was connected to the other receiver. The receivers could be interchanged by command. Two radio transmitters, coupled to two traveling-wave tube amplifiers, produced 8 W power each in S-band. Communication uplink (earth to spacecraft) operated at 2110 MHz, and downlink (spacecraft to earth) at 2292 MHz. At Jupiter's distance, round-trip communication time took 92 min. Data were received at the Deep Space Network (DSN). The spacecraft was temperature-controlled to between -23 and +38 deg C (-10 to +100 deg F). An additional experiment, a low-sensitivity fluxgate magnetometer, was added to the Pioneer 11 payload. Instruments studied the interplanetary and planetary magnetic fields; solar wind properties; cosmic rays; transition region of the heliosphere; neutral hydrogen abundance; distribution, size, mass, flux, and velocity of dust particles; Jovian aurorae; Jovian radio waves; the atmospheres of planets and satellites; and the surfaces of Jupiter, Saturn, and some of their satellites. Instruments carried for these experiments were magnetometer, plasma analyzer (for solar wind), charged-particle detector, ionizing detector, non-imaging telescopes with overlapping fields of view to detect sunlight reflected from passing meteoroids, sealed pressurized cells of argon and nitrogen gas for measuring penetration of meteoroids, UV photometer, IR radiometer, and an imaging photopolarimeter, which produced photographs and measured the polarization. Further scientific information was obtained from celestial mechanics and occultation phenomena. This spacecraft, like Pioneer 10, contains a plaque that has a drawing depicting man, woman, and the location of the sun and earth in the galaxy. During its closest approach, December 4, 1974, Pioneer 11 passed to within 43,000 km of Jupiter's cloud tops. It passed by Saturn on August 5, 1979, at a distance of 21,400 km from Saturn's cloud tops.

------- PIONEER 11, ANDERSON----------------------------------

INVESTIGATION NAME- CELESTIAL MECHANICS

NSSDC ID- 73-019A-09 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
ASTRONOMY
CELESTIAL MECHANICS

PERSONNEL
PI - J.D. ANDERSON NASA-JPL
OI - G.W. NULL NASA-JPL

BRIEF DESCRIPTION

In this investigation, two-way Doppler tracking of the spacecraft was used to make more precise determinations of planetary masses; the heliocentric orbits of Jupiter and Saturn; and the gravitational fields of the Sun, Jupiter, Saturn, and the Galilean and Saturnian satellites.

------- PIONEER 11, BARNES-------------------------------------

INVESTIGATION NAME- QUADRISPHERICAL PLASMA ANALYZER

NSSDC ID- 73-019A-13 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL
PI - A. BARNES NASA-ARC
OI - L.A. FRANK U OF IOWA
OI - R. LUEST ESA
OI - D.S. INTRILIGATOR CARMEL RESEARCH CENTER
OI - V.T. ZAVIENTSEFF(NLA) NASA-ARC
OI - Z.A. SMITH NOAA-SEL
OI - F.L. SCARF TRW SYSTEMS GROUP
OI - H.R. COLLARD NASA-ARC
OI - W.C. FELDMAN LOS ALAMOS NAT LAB
OI - D.D. MCKIBBIN NASA-ARC

BRIEF DESCRIPTION

The instrument consisted of dual 90-deg quadrispherical electrostatic analyzers, one with 26 individual particle detectors and the other with 5 current collectors. The system was capable of measuring incident plasma distribution parameters over the energy range 0.1 to 18 keV for protons and approximately 1 to 500 eV for electrons. The high-resolution analyzer with a constant of 9 keV/Q per kV applied to the plates, had a mean plate radius of 9 cm and separation of 0.5 cm. This analyzer was used to measure ions only, and had 26 channeltrons mounted on the semicircular exit to the analyzer. The aperture pointed through a wide slit in the back of the spacecraft high-gain antenna reflector and pointed along the spin axis toward the earth (and therefore the sun). The edges of the antenna reflector limited the viewing of the instrument to 73 deg with respect to the spin axis. The channeltrons covered a range of plus or minus 51 deg. Each channeltron near

the center covered 3 deg and approximately 8 deg near the edges of the analyzer. The angular width perpendicular to the long angular width was about 2 deg. In half the spin period the whole cone of half-angle 51 deg centered on the sun was swept out. A medium-energy analyzer with a mean radius of 12 cm and a 1-cm plate separation (constant of 6 keV/Q per kV applied) was used to detect both ions and electrons. The detectors were five flat-surface current collectors. The three center collectors each covered 15 deg and covered the angular range of plus or minus 22.5 deg from the spin axis. The two outside collectors had an angular width of 47.5 deg and were located at plus or minus 46.25 deg from the center of the analyzer. There was a variety of possible operating modes for the experiment; however, the principal mode utilized during the encounter phase was one in which the analyzer plate potential was stepped through its range every one-half revolution of the spacecraft, and all current collectors or channeltrons were read out at the peak flux roll angle. The high and medium resolution analyzers operated independently, so a cross check between these analyzers was possible. The dynamic range for the particle fluxes was from 1.0E+2 to 3.0E+9/(sq cm-s) and the proton temperature down to 2.0E+3 deg K could be ascertained. Data include the interplanetary region.

------- PIONEER 11, FILLIUS--------------------------------------

INVESTIGATION NAME- JOVIAN TRAPPED RADIATION

NSSDC ID- 73-019A-05 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
PLANETOLOGY

PERSONNEL
PI - R.W. FILLIUS U OF CALIF, SAN DIEGO
OI - C.E. MCILWAIN U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION
This experiment consisted of an array of five particle detectors with electron thresholds in the range .01 to 35 MeV and proton thresholds in the range 0.15 to 80 MeV. A Cerenkov counter (C) had four output channels (C1, C2, C3, and CDC) sensitive to electrons having energies above 5, 8, 12, and 1 MeV, respectively. An electron scatter counter (E) had three output channels (E1, E2, and E3) sensitive to electrons above .16, .26, and .46 MeV. A minimum ionization counter (M) had three output channels: M1, sensitive to electrons having energies greater than 35 MeV; M2, measuring background; and M3, sensitive to protons having energies greater than 80 MeV. The last two sensors were scintillator detectors (SP and SE), both of which had energy thresholds of 10 keV for electrons and 150 keV for protons. The sensitivity of the SE detector to protons was about a factor of 10 lower than its sensitivity to electrons. Thus, the SEDC channel effectively measured the electron flux, which could then be subtracted from the SPDC channel response to obtain the proton flux. Several other channels listed above required corrections to obtain the fluxes of the species indicated. The detector channels could be programmed for readout in any one of four patterns at each of the eight spacecraft bit-rate modes. During encounter when the spacecraft was operating in the highest bit-rate mode, the minimum time to sample one channel was 1.5 s and the time to obtain a complete scan through all channels was 108 s. Since the directional detectors pointed perpendicularly to the spin axis and the spin rate was 5 rpm, pitch-angle measurements were obtained. Although this experiment was primarily designed for encounter studies, some data were obtained at low rates in interplanetary space. A description of the instrumentation and initial Pioneer 10 results was published in J. Geophys. Res., v. 79, p. 3589, 1974.

------- PIONEER 11, GEHRELS--------------------------------------

INVESTIGATION NAME- IMAGING PHOTOPOLARIMETER (IPP)

NSSDC ID- 73-019A-07 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
PLANETARY ATMOSPHERES
PLANETOLOGY

PERSONNEL
PI - T. GEHRELS U OF ARIZONA
OI - D.L. COFFEEN NASA-GISS
OI - J. HAMEEN-ANTTILA U OF ARIZONA
OI - C.E. KENKNIGHT U OF ARIZONA
OI - R.F. HUMMER SANTA BARBARA RES CTR
OI - M.G. TOMASKO U OF ARIZONA
OI - W. SWINDELL U OF ARIZONA

BRIEF DESCRIPTION
The Imaging Photopolarimeter (IPP) experiment used during Jovian and Saturnian encounter made simultaneous, two-color (blue - 3900 to 4900 A, red - 5800 to 7000 A) polarimetric and radiometric measurements, and moderate-resolution (about 200 km at best) spin-scan images of Jupiter and the Jovian satellites and Saturn and some of its satellites. The polarimetric and radiometric work was performed using an 8- by 8-mrad field-stop aperture, while the spin-scan imaging used a 0.5- by 0.5-mrad aperture stop. Relative radiometric calibration was derived using an internal tungsten lamp. Long-term absolute calibration of the instrument was accomplished by means of a sunlight diffusor/attenuator element located in the spacecraft antenna structure. Primary radiometric calibration was obtained throughout the mission by periodically commanding the telescope to view this diffuse backlighted (sunlight) source. The experimental train for the IPP package consisted of the following elements: (1) a near-diffraction-limited 2.54-cm Maksutov telescope of focal ratio f/3.4, (2) a focal-plane wheel containing field-of-view (FOV) apertures, depolarizers, calibration source, etc., (3) a Wollaston prism to split the light into two orthogonally polarized beams, (4) a 45-deg dichromatic mirror that reflected wavelengths of less than 5500 A (blue beam) and transmitted all light of longer wavelength (red beam), (5) a filtering-coated relay lens and folding mirrors for each spectral beam (the two polarizations were separated), and (6) two Bendix channeltron (blue - bialkali S-11, red - S-20) photocathodes for each spectral beam to register the intensity in each polarization component. Polarization data included the interplanetary region.

------- PIONEER 11, INGERSOLL--------------------------------------

INVESTIGATION NAME- INFRARED RADIOMETER

NSSDC ID- 73-019A-08 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
PLANETARY ATMOSPHERES
PLANETOLOGY

PERSONNEL
PI - A.P. INGERSOLL CALIF INST OF TECH
OI - R.W. BOESE NASA-ARC
OI - S.C. CHASE, JR. SANTA BARBARA RES CTR
OI - G. NEUGEBAUER CALIF INST OF TECH
OI - L.M. TRAFTON U OF TEXAS, AUSTIN

BRIEF DESCRIPTION
The Pioneer 11 infrared radiometer experiment measured the Jovian and Saturnian thermal balance, temperature distribution in the outer atmosphere, general surface composition (including the overall hydrogen-to-helium ratio), and dark-side temperature. The instrument consisted of a 7.62-cm reflecting Cassegrain telescope with a 1-deg by 3-deg field of view that illuminated a pair of 88-channel, thin-film bimetallic thermopiles in two bands of the IR spectrum (14 to 25 micrometers and 19 to 56 micrometers) to measure the irradiance. The two-channel radiometer was similar to those flown on Mariners 6 and 7, but was more accurate and had better spatial resolution.

------- PIONEER 11, JUDGE------------ ------------------------

INVESTIGATION NAME- ULTRAVIOLET PHOTOMETRY

NSSDC ID- 73-019A-06 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
PLANETARY ATMOSPHERES
PLANETOLOGY
PARTICLES AND FIELDS

PERSONNEL
PI - D.L. JUDGE U OF SOUTHERN CALIF
OI - R.W. CARLSON NASA-JPL

BRIEF DESCRIPTION
This experiment consisted of a broadband photometer, sensitive between 200 and 800 A. During the cruise phase of the mission, this experiment was used to search for the supersonic-to-subsonic transition region in the solar wind. During the Jovian encounter, this experiment was used to look for evidence of an auroral oval on the Jovian dayside, to find the ratio of hydrogen to helium in the Jovian atmosphere, and to find the temperature of the outer portion of the Jovian atmosphere. Evidence of helium was found in the interplanetary region, indicating interactions between charged particles and neutral hydrogen.

------- PIONEER 11, KINARD--------------------------------------

INVESTIGATION NAME- METEOROID DETECTORS

NSSDC ID- 73-019A-04 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
INTERPLANETARY DUST

PERSONNEL
PI - W.H. KINARD NASA-LARC
OI - J.M. ALVAREZ NASA-LARC
OI - D.H. HUMES NASA-LARC

BRIEF DESCRIPTION
This experiment was designed to measure the number of meteoroid impacts on the Pioneer 11 spacecraft. The instrument was sensitive to meteoroids of mass approximately 1E-8 g. The instrumentation consisted of 234 cells pressurized with an argon-nitrogen mixture. Penetration of the 50-micrometer-thick skin of the cell resulted in the loss of gas at a rate proportional to the size of the hole. Gas loss was detected with a cold cathode device. The cells were initially pressurized to 1175 torrs at 295 deg K. The cells were formed by welding together two sheets of stainless steel in a configuration resembling an air mattress. The exposed area of each cell was 2.45E-3 sq m. The cells were mounted on the back of the high gain antenna dish. For a description of the experiment see D. H. Humes et al., J. Geophys. Res., v. 79, pp. 3677-3684, 1974.

------- PIONEER 11, KLIORE--

INVESTIGATION NAME- S-BAND OCCULTATION

NSSDC ID- 73-019A-10 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.J.	KLIORE	NASA-JPL
OI - G.	FJELDBO(NLA)	NASA-JPL
OI - D.L.	CAIN	NASA-JPL
OI - B.L.	SEIDEL	NASA-JPL
OI - S.I.	RASOOL	IBM

BRIEF DESCRIPTION
This experiment utilized the S-band (2292-MHz, 8-W) spacecraft radio transmitter signal characteristics to obtain information about the ionospheres and atmospheres of Jupiter, Io, and Saturn. Entrance into and exit from Jupiter and Io occultations provided changes in the signal characteristics from which atmospheric temperature, pressure, and electron density profiles could be calculated. Temperature and pressure profiles were limited to levels above the pressure of one earth atmosphere. Signal occultation also provided a determination of the planetary diameter.

------- PIONEER 11, MCDONALD--

INVESTIGATION NAME- COSMIC-RAY SPECTRA

NSSDC ID- 73-019A-12 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL

PI - F.B.	MCDONALD	NASA HEADQUARTERS
OI - K.G.	MCCRACKEN	CSIRO
OI - W.R.	WEBBER	U OF NEW HAMPSHIRE
OI - E.C.	ROELOF	APPLIED PHYSICS LAB
OI - B.J.	TEEGARDEN	NASA-GSFC
OI - J.H.	TRAINOR	NASA-GSFC

BRIEF DESCRIPTION
This experiment consisted of three 3-element telescopes, all looking normal to the spacecraft spin axis. A bidirectional telescope measured 20- to 800-MeV/nucleon particles with 5 to 10% energy resolution. Another telescope measured 3- to 22-MeV/nucleon particles with 5% resolution. These two telescopes measured particles with Z values between 1 and 8. The third telescope measured 50-keV to 1-MeV electrons and 50-keV to 20-MeV protons with 20% resolution. Data include the interplanetary region.

------- PIONEER 11, SIMPSON--

INVESTIGATION NAME- CHARGED PARTICLE COMPOSITION

NSSDC ID- 73-019A-02 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL

PI - J.A.	SIMPSON	U OF CHICAGO
OI - J.J.	O'GALLAGHER	U OF MARYLAND
OI - A.	TUZZOLINO	U OF CHICAGO

BRIEF DESCRIPTION
This experiment used two telescopes to measure the composition and energy spectra of solar (and galactic) particles above about 0.5 MeV/nucleon. The main telescope consisted of five collinear elements (three solid state, one CsI, and one sapphire Cerenkov) surrounded by a plastic anticoincidence shield. The telescope had a 60-deg, full-angle acceptance cone with its axis approximately normal to the spacecraft spin axis, permitting 8-sectored information on particle arrival direction. Four elements of the main telescope were pulse-height analyzed, and low- and high-gain modes could be selected by command to permit resolution of the elements H through Ni or of electrons and the isotopes of H, He, and light nuclei. A selection-priority scheme was included to permit sampling of less abundant particle species under normal and solar-flare conditions. The low-energy telescope was essentially a two-element, shielded, solid-state detector with a 70-deg, full-angle acceptance cone. The first element was pulse-height analyzed, and data were recorded by sectors. Data include the interplanetary region.

------- PIONEER 11, SMITH--

INVESTIGATION NAME- MAGNETIC FIELDS

NSSDC ID- 73-019A-01 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PLANETARY MAGNETIC FIELD
PARTICLES AND FIELDS

PERSONNEL

PI - E.J.	SMITH	NASA-JPL
OI - D.S.	COLBURN	NASA-ARC
OI - P.	DYAL	NASA-ARC
OI - C.P.	SONETT	U OF ARIZONA
OI - P.J.	COLEMAN, JR.	U OF CALIF, LA
OI - L.	DAVIS, JR.	CALIF INST OF TECH
OI - D.E.	JONES	BRIGHAM YOUNG U

BRIEF DESCRIPTION
The magnetometer on Pioneer 11 was a triaxial helium magnetometer with seven dynamic ranges, from plus or minus 2.5 nT to plus or minus 1.0E-3 T. The linearity was 0.1% and the noise threshold was 0.01 nT rms for 0-1 Hz. The accuracy was 0.5% of full scale range. The experimenter used RTN coordinates in the data analysis. In this system, R (or X) is radially outward from the sun, T (or Y) was parallel to the sun's equatorial plane and had its direction given by the cross product of the sun's spin vector into the radial direction (i.e., into R), and N (or Z) completed the right-handed orthogonal system (positive northward). A detailed instrument description may be found in Smith et al., IEEE Trans. On Magnetics, v. M-11, p. 962, July 1975. Data include the interplanetary region.

------- PIONEER 11, VAN ALLEN--

INVESTIGATION NAME- JOVIAN CHARGED PARTICLES

NSSDC ID- 73-019A-11 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - J.A.	VAN ALLEN	U OF IOWA

BRIEF DESCRIPTION
This experiment used seven miniature Geiger tubes in three arrays to measure proton and electron fluxes near Jupiter and Saturn. Detector groupings were as follows: (1) a three-element (A, B, and C) differentially shielded telescope. Tube C was shielded omnidirectionally and was used for background subtraction to provide rates such as A-C (5 to 21 MeV electrons and 30 to 77.5 MeV protons) and B-C (0.55 to 21 MeV electrons and 6.6 to 77.5 MeV protons); (2) a three-element triangular array, each element responding to electrons above 31 MeV and protons above 77.5 MeV; and (3) a thin-window tube (G) with a gold-plated elbow as the entrance aperture to admit scattered electrons above 0.06 MeV while discriminating strongly against protons. For a description of the similar experiment on Pioneer 10, see J. A. Van Allen et al., J. Geophys. Res., v. 79, p. 3395, 1974. Early results are given in Science, v. 188, p. 459, 1975. Data include the interplanetary region.

**************************** PIONEER VENUS 1 ******************

SPACECRAFT COMMON NAME- PIONEER VENUS 1
ALTERNATE NAMES- PIONEER VENUS 1978 ORBIT, 10911
PIONEER VENUS ORBITER

NSSDC ID- 78-051A

LAUNCH DATE- 05/20/78 WEIGHT- 517. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- ATLAS-CENT

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- VENUS ORBITER	EPOCH DATE- 12/04/78
ORBIT PERIOD- 1440. MIN	INCLINATION- 105. DEG
PERIAPSIS- 200. KM ALT	APOAPSIS- 66614. KM ALT

ORIGINAL PAGE IS
OF POOR QUALITY

PERSONNEL

MG - E.	MONTOYA	NASA HEADQUARTERS
SC - H.	BRINTON	NASA HEADQUARTERS
PM - R.O.	FIMMEL	NASA-ARC
PS - L.	COLIN	NASA-ARC
PS - R.A.	CRAIG	NASA-ARC

BRIEF DESCRIPTION

Pioneer Venus 1 was the first of two missions designed to conduct a comprehensive investigation of the atmosphere of Venus. The spacecraft was a solar-powered cylinder about 250 cm in diameter with its spin axis spin-stabilized perpendicular to the ecliptic plane. A high-gain antenna was mechanically despun to remain focused on the earth. The instruments were mounted on a shelf within the spacecraft except for a magnetometer mounted at the end of a boom to ensure against magnetic interference from the spacecraft. Pioneer Venus 1 measured the detailed structure of the upper atmosphere and ionosphere of Venus, investigated the interaction of the solar wind with the ionosphere and the magnetic field in the vicinity of Venus, determined the characteristics of the atmosphere and surface of Venus on a planetary scale, determined the planet's gravitational field harmonics from perturbations of the spacecraft orbit, and detected gamma-ray bursts.

------- PIONEER VENUS 1, BARNES-------------------------------

INVESTIGATION NAME- SOLAR WIND PLASMA ANALYZER (OPA)

NSSDC ID- 78-051A-18 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI - A.	BARNES	NASA-ARC
OI - H.R.	COLLARD	NASA-ARC
OI - D.D.	MCKIBBIN	NASA-ARC
OI - J.D.	MIHALOV	NASA-ARC
OI - R.C.	WHITTEN	NASA-ARC
OI - D.S.	INTRILIGATOR	CARMEL RESEARCH CENTER

BRIEF DESCRIPTION

The instrument for this experiment was a quadrispherical electrostatic analyzer (similar to the plasma instrument on Pioneers 10 and 11), with five current collectors and electrometers. The energy/charge range was 50-8000 (ions) in 32 steps and 1-500 (electrons) in 16 steps. The angular range covered was plus or minus 85 deg elevation by 360 deg azimuth, and the detector field of view was 15 deg by 25 deg or 15 deg by 45 deg, depending on position. The logic design was essentially that used on Pioneers 8 and 9. The objectives were to measure solar wind conditions outside the Venusian bow shock, inside the magnetosheath flow field, and to study the ionopausal structure. Solar-wind measurements were made during the transit to Venus, particularly to study macroscale problems and to determine average gradients. The near-planet wake region was also available for study.

------- PIONEER VENUS 1, BRACE-------------------------------

INVESTIGATION NAME- ELECTRON TEMPERATURE PROBE (OETP)

NSSDC ID- 78-051A-01 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
PLANETARY IONOSPHERES

PERSONNEL

PI - L.H.	BRACE	NASA-GSFC
OI - M.B.	MCELROY	HARVARD U
OI - A.	PEDERSEN	ESA-ESTEC
OI - A.F.	NAGY	U OF MICHIGAN
OI - T.M.	DONAHUE	U OF MICHIGAN

BRIEF DESCRIPTION

This experiment consisted of a pair of cylindrical Langmuir probes of the type used on the Atmospheric Explorer (AE) series. Two probes were required, so that one was always out of the wake of the spacecraft. In flight, 56 measurements taken at a rate of one per second provided high spatial resolution for the measurements of electron density and temperature. The results of these high-resolution measurements were used both to study the upper atmosphere and the ionosphere and to investigate the interaction of the solar wind with the Venusian ionosphere. This experiment provided measurements over the whole region traversed by the orbiter, covering a large range of solar aspect angles, to yield a more complete configuration of the physical properties of the ionopause region. (See Krehbiel et al., IEEE Trans. Geosci. & Rem. Sensing, GE-18, 49, 1980.)

------- PIONEER VENUS 1, CROFT-------------------------------

INVESTIGATION NAME- GAS-PLASMA ENVIRONMENT-DUAL FREQUENCY EXPERIMENT (OGPE)

NSSDC ID- 78-051A-03 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
GEODESY AND CARTOGRAPHY
PLANETARY IONOSPHERES
PLANETARY ATMOSPHERES

PERSONNEL

TL - T.A.	CROFT	SRI INTERNATIONAL
TM - G.M.	KEATING	NASA-LARC
TM - A.J.	KLIORE	NASA-JPL
TM - R.J.	PHILLIPS	LUNAR + PLANETARY INST
TM - I.I.	SHAPIRO	MASS INST OF TECH
TM - R.	WOO	NASA-JPL

BRIEF DESCRIPTION

This experiment used data obtained from the S-band and X-band radio signals. The objectives were (1) to determine the lateral variations in the Venusian atmosphere and ionosphere, (2) to study the solar wind microscopic flow, and (3) to analyze solar wind scintillations (scale and characteristics of the irregularities in the Venusian atmosphere).

------- PIONEER VENUS 1, DONAHUE-------------------------------

INVESTIGATION NAME- INTERDISCIPLINARY SCIENTIST

NSSDC ID- 78-051A-04 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
AERONOMY
IONOSPHERES
PLANETARY ATMOSPHERES

PERSONNEL

PI - T.M.	DONAHUE	U OF MICHIGAN

BRIEF DESCRIPTION

This investigation combined results obtained from the orbiter mission with results from the multi-probe mission to obtain a unified picture of the atmospheric and ionospheric chemistry and transport processes occurring in the atmosphere of Venus.

------- PIONEER VENUS 1, EVANS-------------------------------

INVESTIGATION NAME- GAMMA BURST DETECTOR (OGBD)

NSSDC ID- 78-051A-05 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - W.D.	EVANS	LOS ALAMOS NAT LAB
OI - J.P.	CONNER	LOS ALAMOS NAT LAB
OI - P.R.	HIGBIE	LOS ALAMOS NAT LAB
OI - R.W.	KLEBESADEL	LOS ALAMOS NAT LAB
OI - R.A.	OLSON	LOS ALAMOS NAT LAB
OI - I.B.	STRONG	LOS ALAMOS NAT LAB
OI - R.E.	SPALDING	SANDIA LABORATORIES

BRIEF DESCRIPTION

An omnidirectional gamma-ray detector employing two Phoswich scintillation spectrometers sensitive to protons from 0.2 to 2.0 MeV was used with logic circuitry to detect the beginning of a gamma event and to initiate a period of rapid data collection. Data were stored in a memory unit for subsequent transmission to earth. Confirmation that a true gamma event had occurred was obtained by comparison with results from other experiments in earth satellites. This experiment provided long-baseline time correlations necessary for calculating accurate source locations. (See R. W. Klebesadel et al., IEEE Trans. Geosci. & Rem. Sensing, GE-18, 76, 1980.)

------- PIONEER VENUS 1, KEATING-------------------------------

INVESTIGATION NAME- ATMOSPHERIC DRAG (OAD)

NSSDC ID- 78-051A-19 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL

PI - G.M.	KEATING	NASA-LARC

BRIEF DESCRIPTION

This experiment made use of the spacecraft S-band and X-band radio signals for data measurements. The objectives were (1) to establish the diurnal variation of thermospheric density and density scale height (2) to determine the relationship of solar wind variations to variations in atmospheric density, (3) to determine the relationship of long and short term variation in solar extreme UV radiation to density variations, (4) to search for phenomena such as a semi-annual variation and super rotation of the thermosphere, and (5) to formulate a thermospheric model for the Venusian atmosphere.

------- PIONEER VENUS 1, KLIORE-------------------------------

INVESTIGATION NAME- RADIO OCCULTATION (ORO)

NSSDC ID- 78-051A-20 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL
PI - A.J. KLIORE NASA-JPL

BRIEF DESCRIPTION
This experiment made use of the S-band and X-band radio signals for data measurements. The objectives were (1) to measure refractivity profiles, (2) to measure S- and X-band dispersion and absorption, (3) to measure electron density height profiles, and (4) to determine the dynamics of the lower atmosphere.

------- PIONEER VENUS 1, KNUDSEN-------------------------------

INVESTIGATION NAME- RETARDING POTENTIAL ANALYZER (ORPA)

NSSDC ID- 78-051A-07 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
PLANETARY IONOSPHERES

PERSONNEL
PI - W.C. KNUDSEN LOCKHEED PALO ALTO
OI - K. SPENNER INST FUR PHYS WELTRAUM
OI - R.C. WHITTEN NASA-ARC

BRIEF DESCRIPTION
This investigation used a Langmuir-probe retarding-potential analyzer designed to measure electron concentration and temperature, major ion concentrations and temperatures, ion drift velocities, and the energy distribution function of ambient photoelectrons. It was an adaptation of the instrument flown on the German Aeros satellite in 1972. Either one of two sensor heads could be used, each consisting of a multigrid cup and electrometer, which could operate in electron, ion, or photoelectron modes, initiated by spacecraft roll pulses. The measurements taken when the sensor axis was closest to the plasma flow velocity vector were transmitted. The aims of the investigation were to improve knowledge of the important ionic reactions in the Venusian ionosphere, to study the plasma transport processes to determine if Venus has a polar wind, to study the processes at the solar wind-ionosphere boundary, and to study similar aims concerning the ambient electron population. (See W. C. Knudsen et al., IEEE Trans. Geosci. & Rem. Sensing, GE-18, 54, 1980.)

------- PIONEER VENUS 1, MASURSKY------------------ -----------

INVESTIGATION NAME- INTERDISCIPLINARY SCIENTIST

NSSDC ID- 78-051A-08 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
GEODESY AND CARTOGRAPHY
PLANETOLOGY

PERSONNEL
PI - H. MASURSKY US GEOLOGICAL SURVEY

BRIEF DESCRIPTION
Surface profile, roughness, and electrical properties data from the Pioneer Venus radar altimeter were analyzed in conjunction with spacecraft-derived gravity information and earth-based radar backscatter data to produce a series of cartographic and geologic maps. The initial maps included geometric arrays of radar profiles and topographic contour data. These were then utilized to produce a shaded relief cartographic map, scale 1 to 25 million, with superimposed contour information. Preliminary Venusian geologic information, inferred from all available spacecraft and earth-based radar data sources, will subsequently be added to the cartographic map base to produce geologic maps. It is anticipated that one to three larger-scale (1 to 5.E6) cartographic and geologic maps of scientifically interesting Venusian surface features also will be produced.

------- PIONEER VENUS 1, MCGILL-------------------------------

INVESTIGATION NAME- INTERDISCIPLINARY SCIENTIST

NSSDC ID- 78-051A-09 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY

PERSONNEL
PI - G.E. MCGILL U OF MASSACHUSETTS

BRIEF DESCRIPTION
Investigations of the topography and geology of Venus were undertaken to assure correct recognition of topographic and material characteristics of the planet and to arrive at the geological and geophysical interpretation of these characteristics.

------- PIONEER VENUS 1, NAGY-------------------------------

INVESTIGATION NAME- INTERDISCIPLINARY SCIENTIST

NSSDC ID- 78-051A-10 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
AERONOMY
PLANETARY IONOSPHERES
PLANETARY ATMOSPHERES

PERSONNEL
PI - A.F. NAGY U OF MICHIGAN

BRIEF DESCRIPTION
Investigations of the ionosphere of Venus were optimized by extending current models and formulating a mission plan best suited to address topics including the physics of the solar wind-ionosphere interaction, energetics of the upper atmosphere, ion chemistry, and the processes responsible for the general structure of the ionosphere, including mechanisms responsible for the maintenance of the nighttime ionosphere.

------- PIONEER VENUS 1, NIEMANN-------------------------------

INVESTIGATION NAME- NEUTRAL MASS SPECTROMETER (ONMS)

NSSDC ID- 78-051A-11 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
AERONOMY
PLANETARY ATMOSPHERES

PERSONNEL
PI - H.B. NIEMANN NASA-GSFC
OI - G.R. CARIGNAN U OF MICHIGAN
OI - R.E. HARTLE NASA-GSFC
OI - N.W. SPENCER NASA-GSFC

BRIEF DESCRIPTION
The experiment used a quadrupole mass spectrometer with three ion-source operating modes and three mass-scanning modes. The ion source could be operated alternately in open and closed configurations to increase accuracy. An adaptive mass scan was used to reduce the bit rate required for a given information-return rate. The resolution was 1.E-4 for adjacent masses, and the mass range was 1 to 45 u. Vertical and horizontal density variations of the major neutral constituents of the upper atmosphere of Venus were detected and measured to define the dynamic, chemical, and thermal states of the upper atmosphere. Important constituents measured were He, O, O2, CO, CO2 and/or N2, and A. It was also possible to study H, D and/or H2, C, and NO. (See H. B. Niemann et al., IEEE Trans. Geosci. & Rem. Sensing, GE-18, 60, 1980.)

------- PIONEER VENUS 1, PHILLIPS-------------------------------

INVESTIGATION NAME- INTERNAL DENSITY DISTRIBUTION (OIDD)

NSSDC ID- 78-051A-23 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
PLANETARY PHYSICS

PERSONNEL
PI - R.J. PHILLIPS LUNAR + PLANETARY INST
PI - W.L. SJOGREN NASA-JPL

BRIEF DESCRIPTION
This experiment used the S-band and X-band radio signals for data measurements. The objectives were (1) to determine the internal mass distribution and the physical processes that have operated to produce the distribution, (2) to determine the relationship of the surface morphology to the internal density distribution, (3) to determine the amount of isostatic compensation of the Venusian topography, and (4) to describe an evolutionary track for Venus that is consistent with the above.

------- PIONEER VENUS 1, RUSSELL-------------------------------

INVESTIGATION NAME- MAGNETOMETER (OMAG)

NSSDC ID- 78-051A-12 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
ATMOSPHERIC PHYSICS

PERSONNEL

PI - C.T.	RUSSELL	U OF CALIF, LA
OI - P.J.	COLEMAN, JR.	U OF CALIF, LA
OI - F.V.	CORONITI	U OF CALIF, LA
OI - C.F.	KENNEL	U OF CALIF, LA
OI - R.L.	MCPHERRON	U OF CALIF, LA
OI - G.L.	SISCOE	U OF CALIF, LA

BRIEF DESCRIPTION

This experiment used a triaxial fluxgate magnetometer with two ring-core sensors at the end of a magnetometer boom and one ring-core sensor, at 45 deg to the spin axis, halfway down the boom. The drive and electronics design had been used on the Apollo 15 and 16 subsatellites. The objectives were to determine any planetary and remnant magnetic fields, to deduce the location and strength of the ionospheric current system, to determine the energy and mass balance in the upper atmosphere of Venus, to determine the nature of the solar wind interaction with Venus, and to study the near-wake region of Venus and the structure of the Venusian bow shock. Interplanetary objectives were to determine the perturbation of the near-planet region by Venus and to compare the properties of the average field at 0.7 and 1.0 AU. The instrument was intended to, in the worst case of low-bit and low-sample rates, measure one vector per 32 s. While in Venus orbit, when the spacecraft was coasting through the interplanetary region in the apoapsis mode, the sample rate was one vector per 8 s. While the spacecraft was passing through the Venusian ionosphere in the periapsis mode, the sample rate was four vectors per s. (See C. T. Russell et al., IEEE Trans. Geosci. & Rem. Sensing, GE-18, 32, 1980.)

------- PIONEER VENUS 1, SCARF--------------------------------

INVESTIGATION NAME- ELECTRIC FIELD DETECTOR (OEFD)

NSSDC ID- 78-051A-13 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI - F.L.	SCARF	TRW SYSTEMS GROUP
OI - I.M.	GREEN	TRW SYSTEMS GROUP

BRIEF DESCRIPTION

This experiment consisted of a modified version of the Pioneer 8 and Pioneer 9 experiments to measure the electric-field components in four 30%, narrow-band channels centered at 100, 730, 7350, and 30,000 Hz. The aims of the investigation were to perform an analysis of VLF electric fields at Venus and to elucidate the plasma interactions between the solar wind and the ionospheric or exospheric plasma. The role of plasma instabilities in modifying the heat flux from the solar wind and in thermalizing newly-born ions from Venus was also studied. A self-contained balanced V-type antenna with a differential preamplifier was employed to make the measurements. At the 512-bps satellite mode, one frequency scan per second was obtained. (See F. L. Scarf et al., IEEE Trans. Geosci. & Rem. Sensing, GE-18, 36, 1980.)

------- PIONEER VENUS 1, SCHUBERT----------------------------

INVESTIGATION NAME- INTERDISCIPLINARY SCIENTIST

NSSDC ID- 78-051A-14 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
MAGNETOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
PLANETOLOGY
GEODESY AND CARTOGRAPHY

PERSONNEL

PI - G.	SCHUBERT	U OF CALIF, LA

BRIEF DESCRIPTION

Measurements of plasma temperatures, magnetic fields, particle composition, and other data were used to develop and test theories of atmospheric circulation and solar wind-ionosphere interactions. In the case of topography and gravity, the data (altimetry and tracking) were used both in descriptive fashion, to simply characterize the surface of Venus and its gravitational field, and in a more quantitative way to model the internal structure of the planet.

------- PIONEER VENUS 1, SHAPIRO------------------------------

INVESTIGATION NAME- CELESTIAL MECHANICS (OCM)

NSSDC ID- 78-051A-21 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
CELESTIAL MECHANICS

PERSONNEL

PI - I.I.	SHAPIRO	MASS INST OF TECH

BRIEF DESCRIPTION

This experiment used the S-band and X-band radio signals for data measurements. The objectives were (1) to model the gravity field of Venus, (2) to estimate the direction and magnitude of the Venus spin vector, (3) to bound the magnitude of (and possibly estimate) the polar motion of Venus, (4) to determine the density profile of the upper atmosphere, and (5) to determine a connection between the coordinate system of planetary ephemerides and an inertial coordinate system referenced to extragalactic radio sources.

------- PIONEER VENUS 1, STEWART------------------------------

INVESTIGATION NAME- PROGRAMMABLE ULTRAVIOLET SPECTROMETER (OUVS)

NSSDC ID- 78-051A-15 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
AERONOMY
IONOSPHERES

PERSONNEL

PI - A.I.	STEWART	U OF COLORADO
OI - C.A.	BARTH	U OF COLORADO
OI - C.W.	HORD	U OF COLORADO
OI - G.E.	THOMAS	U OF COLORADO
OI - D.	ANDERSON	NOAA-SEL

BRIEF DESCRIPTION

This investigation used a 125-mm Cassegrain telescope on a 125-mm Ebert-Fastie spectrometer with a programmable grating drive. Airglow, scattered sunlight, and hydrogen Lyman-alpha emissions were detected in the thermosphere, mesosphere, and exosphere of Venus. These measurements were used to establish and map the composition, temperature, and photochemistry of the thermosphere and ionosphere, to determine the pressure at and above the visible cloud tops, and to establish the distribution and escape rate of atomic hydrogen. The instrument operated in the 1100-3400 A region. (See A. I. F. Stewart, IEEE Trans. Geosci. & Rem. Sensing, GE-18, 65, 1980.)

------- PIONEER VENUS 1, TAYLOR, JR.--------------------------

INVESTIGATION NAME- ION MASS SPECTROMETER 1-60AMU (OIMS)

NSSDC ID- 78-051A-17 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY IONOSPHERES
PLANETARY ATMOSPHERES

PERSONNEL

PI - H.A.	TAYLOR, JR.	NASA-GSFC
OI - S.J.	BAUER	GRAZ U
OI - R.E.	HARTLE	NASA-GSFC
OI - H.C.	BRINTON	NASA HEADQUARTERS
OI - J.R.	HERMAN	NASA-GSFC
OI - T.M.	DONAHUE	U OF MICHIGAN
OI - P.A.	CLOUTIER	RICE U
OI - F.C.	MICHEL	RICE U

BRIEF DESCRIPTION

The composition and concentration of thermal positive ions in the ionosphere of Venus were determined and interpreted in terms of vertical and horizontal components. The instrument used was a Bennett radio-frequency mass spectrometer based on the design of those flown on OGO and Atmospheric Explorer satellites. A mass range of 1 to 60 u was covered with a variety of automatic scan-search modes available. (See H. A. Taylor et al., IEEE Trans. Geosci. & Rem. Sensing, GE-18, 44, 1980.)

------- PIONEER VENUS 1, TRAVIS-------------------------------

INVESTIGATION NAME- CLOUD PHOTOPOLARIMETER

NSSDC ID- 78-051A-06 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL
PI - L. TRAVIS NASA-GISS
OI - P.H. STONE MASS INST OF TECH
OI - A.A. LACIS NASA-GISS

BRIEF DESCRIPTION
This experiment used a simplified version of the Imaging Photopolarimeter (IPP) flown on Pioneers 10 and 11 to provide low-resolution, four-color maps of the Venusian cloud cover with a high-resolution imaging capability near apocenter. The principal objective of this investigation was to determine the properties of the clouds and haze, including the vertical and horizontal distribution of the particles, cloud particle size and refractive index, the cloud-top height, and the number density of particles.

------- PIONEER VENUS 1, WOO------------------------------------

INVESTIGATION NAME- ATMOSPHERIC AND SOLAR CORONA TURBULENCE (OTUR)

NSSDC ID- 78-051A-22 INVESTIGATIVE PROGRAM CODE EL

INVESTIGATION DISCIPLINE(S) PLANETARY ATMOSPHERES

PERSONNEL
PI - R. WOO NASA-JPL

BRIEF DESCRIPTION
This experiment made use of the S-band and X-band radio signals for data measurements. The objectives of the experiment were to measure (1) the intensity variation of turbulence with altitude, (2) planetary latitude and longitude, and (3) the distribution of scale sizes in the atmosphere.

*************************** PROGNOZ 8 ************************

SPACECRAFT COMMON NAME- PROGNOZ 8
ALTERNATE NAMES- 12116

NSSDC ID- 80-103A

LAUNCH DATE- 12/25/80 WEIGHT- 915. KG
LAUNCH SITE- TYURATAM (BAIKONUR COSMODROME), U.S.S.R.
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
U.S.S.R. SAS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 12/25/80
ORBIT PERIOD- 5689. MIN INCLINATION- 65.8 DEG
PERIAPSIS- 980. KM ALT APOAPSIS- 197390. KM ALT

PERSONNEL
PS - A.A. GALEEV IKI

BRIEF DESCRIPTION
This spacecraft was a member of a continuing series to measure charged particles, plasma, magnetic fields and electromagnetic radiation. Although no specific information has been provided concerning the experiments and the scientific objectives, it is likely they were both similar to Prognoz 7. The study of solar UV, X-ray, and gamma-ray emissions was continued along with the monitoring of electrons and protons in interplanetary space and the magnetosphere. The investigation of the nuclear compositions of solar and galactic cosmic rays was continued along with the measurement of in situ magnetic fields. A request was made to the Project Scientist to provide descriptions of the various instruments, but no response was received. It was known from other sources that the solar X-ray experiment was the same as that flown on Prognoz 7.

------- PROGNOZ 8, LICKIN------------------------------------

INVESTIGATION NAME- SOLAR X-RAY SPECTROMETER

NSSDC ID- 80-103A-01 INVESTIGATIVE PROGRAM SCIENCE

INVESTIGATION DISCIPLINE(S) SOLAR PHYSICS

PERSONNEL
PI - O.B. LICKIN IKI
PI - B. VALENICEK ASTRONOMICAL INST

BRIEF DESCRIPTION
Two detectors were used to record solar X rays in the energy range 2.2 to 98 keV. A NaI (Tl) scintillation detector 3 mm thick with 4.5 sq cm area was used for the energy range 6 to 98 keV. Pulse-amplitude analysis was done for five contiguous energy channels over this range. An additional energy range of 2.2 to 7 keV was covered by a gas-filled, beryllium-window proportional counter, using amplitude discrimination. The high voltage to the gas counter was automatically switched off by a rate-sensitive device during passage through the radiation belts, to prolong the life of the detector. The same instrument was used on Prognoz 5, 6, and 7.

*************************** PROGNOZ 9 ************************

SPACECRAFT COMMON NAME- PROGNOZ 9
ALTERNATE NAMES- 14163

NSSDC ID- 83-067A

LAUNCH DATE- 07/01/83 WEIGHT- KG
LAUNCH SITE- UNKNOWN, U.S.S.R.
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
U.S.S.R. SAS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 07/02/83
ORBIT PERIOD- 38448. MIN INCLINATION- 65.5 DEG
PERIAPSIS- 380. KM ALT APOAPSIS- 720000. KM ALT

PERSONNEL
PS - A.A. GALEEV IKI

BRIEF DESCRIPTION
This spacecraft was one of a continuing series to measure electromagnetic radiation, magnetic fields, plasma, and charged particles. Although the specifics on what experiments were flown are not available, it is known that no particles or fields experiments were flown on Prognoz 9. Possibly one plasma experiment was on board. Clearly the main goals were measurements in the electromagnetic spectrum and the one experiment that is known specifically is an 8-mm radio telescope.

------- PROGNOZ 9, STRUKOV------------------------------------

INVESTIGATION NAME- COSMIC RADIO TELESCOPE

NSSDC ID- 83-067A-01 INVESTIGATIVE PROGRAM SCIENCE

INVESTIGATION DISCIPLINE(S) ASTRONOMY

PERSONNEL
PI - I.A. STRUKOV IKI
OI - R.Z. SAGDEEV IKI
OI - N.S. KARDASHEV IKI
OI - D.P. SKULACHEV IKI
OI - N.A. EYSMONT IKI

BRIEF DESCRIPTION
The instrument employed an antenna with a 6-deg beam width. It operated at a wavelength of 8 mm and used a parametric amplifier. The modulation scheme permitted a comparison of the brightness temperature of the sky where the antenna was pointed and at an angle of 90 deg away. The relative error, delta T/T, was less than 1.E-4.

*************************** SAKIGAKE ************************

SPACECRAFT COMMON NAME- SAKIGAKE
ALTERNATE NAMES- MS-T5

NSSDC ID- 85-001A

LAUNCH DATE- 01/07/85 WEIGHT- 138. KG
LAUNCH SITE- KAGOSHIMA SPACE CENTER, JAPAN
LAUNCH VEHICLE- M-3SII-1

SPONSORING COUNTRY/AGENCY
JAPAN ISAS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- HELIOCENTRIC EPOCH DATE- 01/14/85
ORBIT PERIOD- 318.6 DAYS INCLINATION- 1.012 DEG
PERIAPSIS- .813 AU RAD APOAPSIS- 1.012 AU RAD

PERSONNEL
PM - K. HIRAO ISAS
PS - H. OYA U OF TOHOKU

BRIEF DESCRIPTION
Sakigake is a test spacecraft similar to Planet-A which will fly by Comet Halley at a distance of several million kilometers. It carries instruments to measure plasma wave spectra, solar wind ions, and interplanetary magnetic fields. The spacecraft is spin-stabilized at two different rates (5 and 0.2 rpm) during the mission. It is equipped with hydrazine thrusters for attitude and velocity control, star and sun sensors for attitude determination, and a mechanically despun off-set parabolic dish for long-range communication.

------- SAKIGAKE, OYA------------------------------------

INVESTIGATION NAME- PLASMA WAVE SPECTRAL RECEIVERS

NSSDC ID- 85-001A-01 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PLANETOLOGY

PERSONNEL
PI - H. OYA U OF TOHOKU

BRIEF DESCRIPTION
This investigation involves measuring plasma wave spectra within several million kilometers of Comet Halley. Both electric and magnetic field components are measured using sweep-frequency receivers. The measured frequency ranges from 70 Hz to 196 KHz.

------- SAKIGAKE, OYAMA---

INVESTIGATION NAME- ION RETARDING POTENTIAL ANALYZER

NSSDC ID- 85-001A-02 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PLANETOLOGY

PERSONNEL
PI - K. OYAMA ISAS

BRIEF DESCRIPTION
This investigation involves the measurement of the solar wind ion temperature and bulk velocity within a distance of several million kilometers of Comet Halley and in interplanetary space. A retarding potential analyzer is used to obtain the measurements.

------- SAKIGAKE, SAITO---

INVESTIGATION NAME- TRIAXIAL RING-CORE MAGNETOMETERS

NSSDC ID- 85-001A-03 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY MAGNETIC FIELDS
PLANETARY MAGNETIC FIELD

PERSONNEL
PI - T. SAITO U OF TOHOKU

BRIEF DESCRIPTION
This investigation involves the measurement of the vector magnetic field in the interplanetary medium and within several million kilometers of Comet Halley. The magnetometer is constructed with a three-axis ring core and provides a resolution of 1 nT or less.

************************** SME ******************************

SPACECRAFT COMMON NAME- SME
ALTERNATE NAMES- SOLAR MESOSPHERE EXPL, 12887

NSSDC ID- 81-100A

LAUNCH DATE- 10/06/81 WEIGHT- 145. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 10/16/81
ORBIT PERIOD- 95.5 MIN INCLINATION- 97.5 DEG
PERIAPSIS- 535. KM ALT APOAPSIS- 551. KM ALT

PERSONNEL
MG - M.B. WEINREB NASA HEADQUARTERS
MG - G.F. ESENWEIN NASA HEADQUARTERS
SC - S.G. TILFORD NASA HEADQUARTERS
PM - J. PAULSON NASA-JPL
PS - C.A. BARTH U OF COLORADO

BRIEF DESCRIPTION
The Solar Mesosphere Explorer (SME) mission objective was primarily to investigate the processes that create and destroy ozone in the earth's mesosphere and upper stratosphere. Some specific goals were (1) to determine the nature and magnitude of changes in mesospheric ozone densities that are the result of changes in the solar ultraviolet flux; (2) to determine the interrelationship between solar flux, ozone, and the temperature of the upper stratosphere and mesosphere; (3) to determine the interrelationship between ozone and water vapor; and (4) to determine the interrelationship between nitrogen dioxide and ozone. The satellite experiment complement consisted of a solar ultraviolet spectrometer, an ultraviolet ozone spectrometer, an infrared radiometer, a 1.27-micrometer spectrometer, and a nitrogen dioxide spectrometer. In addition, a solar proton alarm detector was carried to measure the integrated solar flux in the range 30 to 500 MeV. Spin stabilized at 5 rpm, the satellite moved in a 3 a.m. to 3 p.m. sun-synchronous orbit. The spacecraft body was a cylinder approximately 1.7 by 1.25 m and consisted of two major modules: the observatory module which housed the scientific instruments, and the spacecraft bus. The spin axis was oriented normal to the orbital plane. The command system was capable of executing commands in real time or from stored program control. Power was supplied by a solar cell array. The telemetry system was used either in a real-time or in a tape-recorder mode. Further details and some measurement results can be found in C. A. Barth et al., "Solar mesosphere explorer: scientific objectives and results," Geophys. Res. Lett., v. 10, n. 4, p. 237, 1983.

------- SME, BARTH---

INVESTIGATION NAME- UV OZONE

NSSDC ID- 81-100A-01 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY

PERSONNEL
PI - C.A. BARTH U OF COLORADO
OI - G.J. ROTTMAN U OF COLORADO
OI - R.J. THOMAS U OF COLORADO
OI - J.C. GILLE NATL CTR FOR ATMOS RES
OI - A.I. STEWART U OF COLORADO
OI - C.W. HORD U OF COLORADO
OI - P.J. CRUTZEN MPI-CHEMISTRY
OI - R.E. DICKINSON NATL CTR FOR ATMOS RES
OI - P.L. BAILEY NATL CTR FOR ATMOS RES
OI - J.F. NOXON NOAA-ERL
OI - G.E. THOMAS U OF COLORADO
OI - J. LONDON U OF COLORADO

BRIEF DESCRIPTION
The objective of the Ultraviolet Ozone Experiment was to measure ozone absorption of Rayleigh-scattered sunlight in the middle ultraviolet region. A dual-channel Ebert-Fastie spectrometer operated in the regions 1880-3100 A and 2230-3404 A and viewed normal to the spin axis. There were 208 or 11 grating steps per scan, respectively. At half maximum the full width of the signal was 15 A.

------- SME, BARTH---

INVESTIGATION NAME- INFRARED RADIOMETER (4 CHANNELS)

NSSDC ID- 81-100A-02 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY

PERSONNEL
PI - C.A. BARTH U OF COLORADO
OI - G.J. ROTTMAN U OF COLORADO
OI - R.J. THOMAS U OF COLORADO
OI - J.C. GILLE NATL CTR FOR ATMOS RES
OI - P.L. BAILEY NATL CTR FOR ATMOS RES
OI - J.F. NOXON NOAA-ERL
OI - A.I. STEWART U OF COLORADO
OI - C.W. HORD U OF COLORADO
OI - G.E. THOMAS U OF COLORADO
OI - J. LONDON U OF COLORADO
OI - P.J. CRUTZEN MPI-CHEMISTRY
OI - R.E. DICKINSON NATL CTR FOR ATMOS RES

BRIEF DESCRIPTION
The objective of the Infrared Radiometer Experiment was to determine the altitude-mixing ratio profiles for water and ozone from thermal emissions. Also, pressure and temperature were determined between 20 and 70 km altitude. The four-channel radiometer/telescope had the following spectral ranges (in micrometers): 17.2 to 13.2, 15.7 to 14.7, 10.6 to 8.6, and 7.2 to 6.1. The full widths at half-maximum were 4.0, 1.0, 2.0, and 1.1 micrometers, respectively. All four channels utilized (Hg-Cd)Te detectors. Wavelength separation was accomplished with multilayer bandpass filters. The instrument line of sight was normal to the spin axis.

------- SME, BARTH---

INVESTIGATION NAME- 1.27 MICROMETER AIRGLOW

NSSDC ID- 81-100A-03 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY

PERSONNEL
PI - C.A. BARTH U OF COLORADO
OI - G.J. ROTTMAN U OF COLORADO
OI - R.J. THOMAS U OF COLORADO
OI - J.C. GILLE NATL CTR FOR ATMOS RES
OI - P.L. BAILEY NATL CTR FOR ATMOS RES
OI - J.F. NOXON NOAA-ERL
OI - A.I. STEWART U OF COLORADO
OI - C.W. HORD U OF COLORADO
OI - G.E. THOMAS U OF COLORADO
OI - J. LONDON U OF COLORADO
OI - P.J. CRUTZEN MPI-CHEMISTRY

OI - R.E. DICKINSON NATL CTR FOR ATMOS RES

BRIEF DESCRIPTION

The objective of the 1.27-Micrometer Airglow Experiment was to obtain limb-scanning measurements of the 1.27-micrometer airglow in the 50- to 90-km altitude range, and of the hydroxyl emission between 60 and 90 km altitude. A dual-channel Ebert-Fastie spectrometer operated in the regions 1.1 to 2.6 micrometers (channel 1) and 1.1 to 3.2 micrometers (channel 2), and viewed normal to the spin axis. The full width of the signal at half-maximum was 123 A. There were 512 grating steps per scan.

------- SME, BARTH--

INVESTIGATION NAME- VISIBLE NITROGEN DIOXIDE

NSSDC ID- 81-100A-04 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI - C.A.	BARTH	U OF COLORADO
OI - G.J.	ROTTMAN	U OF COLORADO
OI - R.J.	THOMAS	U OF COLORADO
OI - J.C.	GILLE	NATL CTR FOR ATMOS RES
OI - P.L.	BAILEY	NATL CTR FOR ATMOS RES
OI - J.F.	NOXON	NOAA-ERL
OI - A.I.	STEWART	U OF COLORADO
OI - C.W.	HORD	U OF COLORADO
OI - G.E.	THOMAS	U OF COLORADO
OI - J.	LONDON	U OF COLORADO
OI - P.J.	CRUTZEN	MPI-CHEMISTRY
OI - R.E.	DICKINSON	NATL CTR FOR ATMOS RES

BRIEF DESCRIPTION

The objective of the Visible Nitrogen Dioxide Experiment was to measure the distribution of nitrogen dioxide in the 25- to 40-km altitude region. This was done by measuring the differential absorption of scattered sunlight by NO2 at two wavelengths near 4400 A. A dual-channel Ebert-Fastie spectrometer operated in the following wavelength intervals: 4390 to 4420 A and 3200 to 6400 A. The signal at half maximum had a full width of 9.8 A and 19.6 A, respectively. There were 512 and 438 grating steps per scan, respectively. The instrument line of sight was normal to the spin axis.

------- SME, BARTH--

INVESTIGATION NAME- SOLAR UV MONITOR

NSSDC ID- 81-100A-05 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
IONOSPHERES
AERONOMY

PERSONNEL

PI - C.A.	BARTH	U OF COLORADO
OI - G.J.	ROTTMAN	U OF COLORADO
OI - R.J.	THOMAS	U OF COLORADO
OI - J.C.	GILLE	NATL CTR FOR ATMOS RES
OI - P.L.	BAILEY	NATL CTR FOR ATMOS RES
OI - J.F.	NOXON	NOAA-ERL
OI - A.I.	STEWART	U OF COLORADO
OI - C.W.	HORD	U OF COLORADO
OI - G.E.	THOMAS	U OF COLORADO
OI - J.	LONDON	U OF COLORADO
OI - P.J.	CRUTZEN	MPI-CHEMISTRY
OI - R.E.	DICKINSON	NATL CTR FOR ATMOS RES

BRIEF DESCRIPTION

The objective of the Ultraviolet Solar Monitor Experiment was to monitor the incoming solar radiation to determine the effect on the ozone concentration. A dual-channel Ebert-Fastie spectrometer measured solar radiation at 1216 A and between 1600 and 3100 A with a resolution of 1 A. The look direction was 45 deg to the spacecraft axis of rotation. In the 3 am to 3 pm sun-synchronous orbit, the instrument scanned through the sun once per orbit. The full width at half maximum was 14 A. There were 512 grating steps per scan.

------- SME, BARTH--

INVESTIGATION NAME- SOLAR PROTON ALARM

NSSDC ID- 81-100A-06 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL

PI - C.A.	BARTH	U OF COLORADO
OI - G.J.	ROTTMAN	U OF COLORADO
OI - R.J.	THOMAS	U OF COLORADO
OI - J.C.	GILLE	NATL CTR FOR ATMOS RES
OI - P.L.	BAILEY	NATL CTR FOR ATMOS RES
OI - J.F.	NOXON	NOAA-ERL
OI - A.I.	STEWART	U OF COLORADO
OI - C.W.	HORD	U OF COLORADO
OI - G.E.	THOMAS	U OF COLORADO
OI - J.	LONDON	U OF COLORADO
OI - P.J.	CRUTZEN	MPI-CHEMISTRY
OI - R.E.	DICKINSON	NATL CTR FOR ATMOS RES

BRIEF DESCRIPTION

The Solar Proton Alarm Detector monitored the integrated solar proton flux in the 30 to 500 MeV range. When the flux exceeded a selected commandable value, the instrument signaled an opportunity to alter science commands to observe the effects of solar protons on atmospheric constituents.

****************************** SMM ******************************

SPACECRAFT COMMON NAME- SMM
ALTERNATE NAMES- SOLAR MAXIMUM MISSION, 11703

NSSDC ID- 80-014A

LAUNCH DATE- 02/14/80 WEIGHT- 2315. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 02/15/80
ORBIT PERIOD- 94.8 MIN INCLINATION- 28.5 DEG
PERIAPSIS- 508. KM ALT APOAPSIS- 512. KM ALT

PERSONNEL

MG - B.R.	MCCULLAR	NASA HEADQUARTERS
SC - D.M.	BOHLIN	NASA HEADQUARTERS
PM - J.P.	CORRIGAN	NASA-GSFC
PS - B.E.	WOODGATE	NASA-GSFC

BRIEF DESCRIPTION

The Solar Maximum Mission (SMM) was designed to provide coordinated observations of solar activity, in particular solar flares, during a period of maximum solar activity. The payload was made up of seven instruments, specifically selected to study the short-wavelength and coronal manifestations of flares. Data were obtained on the storage and release of flare energy, particle acceleration, formation of hot plasma, and mass ejection. Complementary studies were made as part of the SMM guest investigator program and coordinated in situ measurements of flare particle emissions were made from the ISEE 3 satellite. The SMM observatory was approximately 4 m in length, fitting into a circular envelope 2.3 m in diameter. The construction was modular. The instrument module occupied the top 2.3 m and contained all the solar payload instruments together with the fine-pointing sun-sensor system. Below the instrument module was the multimission modular spacecraft (MMS) containing the systems for attitude control, power, communication, and data handling. Between the instrument module and the MMS was the transition adaptor, supporting two fixed solar paddles that supplied between 1500 and 3000 W of power. Quick and coordinated responses to solar flares were considered essential for meeting the scientific objectives of the mission. Therefore, the ground system was designed to facilitate coordinated data evaluation, observation, planning, and command uplink to the onboard stored command processor. Onboard coordination of response to a flare was performed in real time. The attitude-control software allowed observatory re-pointings and slow scanning motions; there was also a special module for tracking a solar feature over many days. SMM operated successfully for 9 months, then developed problems in its attitude control system and in the Coronagraph/Polarimeter experiment. These problems were corrected by the Solar Maximum Repair Mission (SMRM) during the flight of STS 41-C in April 1984. Further details concerning SMM can be found in D. M. Bohlin et. al., Solar Physics, v. 65, p. 5, 1980.

------- SMM, ACTON--

INVESTIGATION NAME- SOFT X-RAY POLYCHROMATOR (XRP)

NSSDC ID- 80-014A-04 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
ASTRONOMY

PERSONNEL

PI - L.W.	ACTON	LOCKHEED PALO ALTO
PI - A.H.	GABRIEL	RUTHERFORD APPLETON L.
PI - J.L.	CULHANE	U COLLEGE LONDON
OI - R.C.	CATURA	LOCKHEED PALO ALTO
OI - J.H.	PARKINSON	U COLLEGE LONDON
OI - C.G.	RAPLEY	U COLLEGE LONDON
OI - B.B.	JONES	RUTHERFORD APPLETON L.

OI - C.	JORDAN	OXFORD U
OI - C.J.	WOLFSON	LOCKHEED PALO ALTO
OI - B.C.	FAWCETT	RUTHERFORD APPLETON L.

BRIEF DESCRIPTION

The soft X-ray polychromator (XRP) was a high-resolution instrument that covered the spectral region from 1.4 to 22.4 A. This area included emission lines which were important for the diagnosis of plasmas in the 1.5E7 to 5.0E7 deg K temperature range, an area especially useful for solar flare and active solar region studies. The XRP consisted of two instruments with a common control data handling and power system. The bent crystal spectrometer (BCS) was designed for high time-resolution studies in the lines of Fe I to Fe XXVI and Ca XIX. It simultaneously observed eight fixed-wavelength intervals with a relatively large FOV (6 by 6 arc-min FWHM). A programmable microprocessor controlled tradeoffs between temporal and spectral resolution that could provide an ultimate temporal resolution of 0.064 s. The flat crystal scanning spectrometer (FCS) provided for 7-channel polychromatic mapping of flaring and other active regions in the resonance lines of O VIII, Ne IX, Mg XI, Si XIII, S XV, Ca XIX and Fe XXV with 14-arc-s spatial resolution. In its spectral scanning mode it could cover the entire 1.4 to 22.4 A region in about 7 s. The FCS consisted of a finely collimated array of flat-crystal spectrometers with a field of view 14 by 14 arc-s that could be rastered in 5-arc-s steps over any portion of a target 7 arc-min square. The FCS provided good spatial and spectral resolution at some cost to temporal resolution. Its programmable microprocessor controlled the operation of the FCS's raster and crystal drive mechanisms. For further information see L. W. Acton et al., Solar Physics, v. 65, p. 53, 1980.

------- SMM, CHUPP---

INVESTIGATION NAME- GAMMA-RAY SPECTROMETER (GRE)

NSSDC ID- 80-014A-07 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
ASTRONOMY

PERSONNEL

PI - E.L.	CHUPP	U OF NEW HAMPSHIRE
OI - D.J.	FORREST	U OF NEW HAMPSHIRE
OI - K.	PINKAU	MPI-EXTRATERR PHYS
OI - C.	REPPIN	MPI-EXTRATERR PHYS
OI - E.	RIEGER	MPI-EXTRATERR PHYS
OI - W.N.	JOHNSON	US NAVAL RESEARCH LAB
OI - R.L.	KINZER	US NAVAL RESEARCH LAB
OI - J.D.	KURFESS	US NAVAL RESEARCH LAB
OI - G.H.	SHARE	US NAVAL RESEARCH LAB
OI - A.S.	JACOBSON	NASA-JPL

BRIEF DESCRIPTION

The gamma-ray spectrometer (GRE) utilized a set of NaI(Tl) detectors and CsI(Na) detectors to form three separate instruments for measurement of the solar gamma-ray spectrum: (1) an actively shielded, multicrystal gamma-ray spectrometer, (2) a high-energy gamma-ray detector, and (3) an auxiliary X-ray detector. The heart of the gamma-ray spectrometer consisted of seven 7.6-sq-cm NaI integral line detectors shielded by an annulus of CsI and a 7.6-cm thick CsI back; the front and back of this system were shielded by a plastic scintillator to reject charged particles. The spectrometer produced a 476-channel pulse-height spectrum every 16 s over the energy range 0.3 to 9 MeV. The energy resolution was less than 7% FWHM at 0.662 MeV. A 2-s time resolution was available in three windows to study prompt line emission at 4.4 and 6.1 MeV; photons from 0.3 to 0.35 MeV were recorded with a 64-ms resolution. The high-energy detector consisted of the seven NaI front detectors of the gamma-ray spectrometer and the large 25-cm diameter by 7.6-cm CsI back detector. Events in the 10- to 100-MeV range occurring in this total detector mass were analyzed by separate pulse-height analyzers. Neutrons above 20 MeV could be distinguished by a difference in signature and in time of flight from the solar surface. The high-energy system had a 2-s time resolution. The auxiliary X-ray detector consisted of two 0.6-cm thick NaI detectors, one with an Al filter to cover the 10- to 80-keV range and the other with an Al-Fe filter to cover the 25- to 140-keV range. The X-ray system had a time resolution of 1 s and four energy channels. For more details on this experiment see D. J. Forrest et al., Solar Physics, v. 65, p. 15, 1980.

------- SMM, DE JAGER---

INVESTIGATION NAME- HARD X-RAY IMAGING SPECTROMETER (HXIS)

NSSDC ID- 80-014A-05 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
ASTRONOMY

PERSONNEL

PI - C.	DE JAGER	U OF UTRECHT
OI - H.F.	VAN BEEK	SPACE RESEARCH LAB
OI - A.P.	WILLMORE	U OF BIRMINGHAM

BRIEF DESCRIPTION

The objective of the hard X-ray imaging spectrometer (HXRIS) experiment was to measure the position, structure, and thermodynamic properties of hot thermal and nonthermal sources in active regions and in flares. This instrument produced two-dimensional images with 8-arc-s resolution over an approximately square area of side 2 arc-min 40 arc-s, or 32-arc-s resolution over a square of side 6 arc-min 24 arc-s. These images were observed in six selectable energy channels, between 3.5 and 30 keV, with a temporal resolution of 0.5 to 7 s, depending on the mode of operation. By means of a flare flag, the experiment alerted other SMM instruments when a flare began and indicated the position of the brightest pixel of the observation. The instrument consisted of 10 etched grid plates, each divided into 576 sections that formed the collimator, and 900 mini-proportional counters that provided a position-sensitive detector system capable of spectral analysis. A dual microcomputer system permitted three modes of operation with commandable parameters that provided for a flexible trade-off between temporal resolution and spatial coverage during different phases of a solar flare. For more details on this experiment see H. F. Van Beek et al., Solar Physics, v. 65, p. 39, 1980.

------- SMM, FROST---

INVESTIGATION NAME- HARD X-RAY BURST SPECTROMETER (HXRBS)

NSSDC ID- 80-014A-06 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
ASTRONOMY

PERSONNEL

PI - K.J.	FROST	NASA-GSFC
OI - L.E.	ORWIG	NASA-GSFC
OI - B.R.	DENNIS	NASA-GSFC
OI - T.L.	CLINE	NASA-GSFC
OI - U.D.	DESAI	NASA-GSFC

BRIEF DESCRIPTION

The hard X-ray burst spectrometer (HXRBS) was concerned with impulsive flare emission to determine the role of energetic electrons in solar flare mechanisms. The instrument consisted of a disk-shaped CsI(Na) central detector and a CsI(Na) active collimator element that surrounded the central detector. Photomultiplier (PM) tubes were used to view the crystals. The central crystal was 0.635 cm thick with a sensitive area of 71 sq cm. The collimator provided a 40 deg FWHM FOV. The energy range 20 to 260 keV was covered by 15 energy-loss channels that provided continuous measurements with a time resolution of 128 ms. The system possessed an energy resolution of 30% FWHM at 122 keV. By use of a circulating 32k-word memory, time resolutions as short as 1 ms were obtained for fast-rising bursts, but no spectral data were available with this memory. Either a constant time (CT) or constant count (CC) mode for the memory could be selected. Using the CT mode during solar observing periods, 10-ms resolution could be obtained for any flare output that triggered the device. Using the CC mode during spacecraft night, gamma-ray bursts could be detected effectively. A charged particle detector was used to sense the South Atlantic anomaly region and to turn off the voltage to the PM tubes. For more detailed information about this experiment see L. E. Orwig et al., Solar Physics, v. 65, p. 25, 1980.

------- SMM, MACQUEEN---

INVESTIGATION NAME- CORONAGRAPH/POLARIMETER

NSSDC ID- 80-014A-01 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
ASTRONOMY

PERSONNEL

PI - R.	MACQUEEN	HIGH ALTITUDE OBS
OI - W.J.	WAGNER	HIGH ALTITUDE OBS
OI - G.A.	DULK	U OF COLORADO
OI - R.	KOPP	LOS ALAMOS NAT LAB
OI - G.W.	PNEUMAN	HIGH ALTITUDE OBS
OI - C.W.	QUERFELD	HIGH ALTITUDE OBS
OI - H.U.	SCHMIDT	MPI-PHYS ASTROPHYS
OI - K.V.	SHERIDAN	CSIRO,DIV OF RADIOPHYS

BRIEF DESCRIPTION

The prime objective of this experiment was to measure the response of the coronal electron density and magnetic field structure to the passage of transient phenomena on rapid time scales. The secondary objective was to determine the density and orientation of the magnetic field structure of the corona on a synoptic basis. The coronagraph/polarimeter (C/P) was the most recent version of a spaceborne externally occulted Lyot coronagraph designed to produce images of the solar corona in seven wavelength bands in the visual spectral range. The C/P

was occulted by three disks with a 2.6-cm diameter primary objective lens of air-spaced doublet design. Coronal quadrants were imaged at f/34 on a meshless vidicon with a nutating mirror arrangement and were recorded on a dedicated tape recorder for subsequent transmission to the earth. Fields of view ranged from 1.5 to 6.0 sq solar radii and were selectable within the coronal quadrant. Spatial resolution was selectable between 6.4 and 12.8 arc-s. Seven filters were available within the range 4465 to 6583 A and polarization was measured by a sequence of three polaroids oriented 60 deg apart (a clear position was also available). The stray radiance was about 3E-10 of the solar brightness in the outer field. The instrument was on an independent gimbal mount and was sun-centered to within 10 arc-s. Experiments with the C/P involved either radiance observations or polarization sequences. For further information see R. MacQueen et al., Solar Physics, v. 65, p. 91, 1980.

------- SMM, TANDBERG-HANSSEN----------------------------------

INVESTIGATION NAME- ULTRAVIOLET SPECTROMETER AND POLARIMETER

NSSDC ID- 80-014A-02 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
ATMOSPHERIC PHYSICS
AERONOMY
ASTRONOMY

PERSONNEL

PI - E.	TANDBERG-HANSSEN	NASA-MSFC
OI - R.G.	ATHAY	HIGH ALTITUDE OBS
OI - J.M.	BECKERS	SACRAMENTO PEAK OBS
OI - J.C.	BRANDT	NASA-GSFC
OI - M.	BRUNER	LOCKHEED PALO ALTO
OI - R.D.	CHAPMAN	NASA-GSFC
OI - B.E.	WOODGATE	NASA-GSFC

BRIEF DESCRIPTION

The ultraviolet spectrometer and polarimeter (UVSP) was a modified version of the telescope-spectrograph system flown on OSO 8. The objective of the experiment was to study solar ultraviolet radiation from active regions, flares, prominences, and the corona, in order to determine temperature, density, velocity and the magnetic field in the solar plasma. A secondary objective was to conduct an aeronomy program to measure the height distribution of major absorbers in the earth's atmosphere, such as ozone and oxygen, and to detect trace constituents and their changes as a result of solar flares. The instrument consisted of a Gregorian telescope and an Ebert spectrometer. The telescope had an effective focal length of 1.8 m, a collecting area of 66.4 sq cm and FOV 256 by 256 arc-s. The secondary mirror had a raster mechanism that allowed up to a 256- by 256-arc-s scan range. Spatial resolution was determined by an entrance slit mechanism that was adjustable from 1 by 1 arc-s to 30 by 30 arc-s. A choice of 22 entrance/exit slit combinations was available. The Ebert spectrometer had a spectral range of 1750 to 3600 A with a resolution of 0.04 A FWHM in the first order and 1150 to 1800 A with a resolution of 0.02 A FWHM in the second order. The polarimeter was located behind the entrance slit and consisted of two retarders (waveplates), a linear polarizer, and drive mechanisms. The control electronics for the instrument included a programmable microprocessor. Simultaneous measurements, at different heights in the chromosphere and in the corona, could be made by selecting any of three sets of four line pairs for spectroscopy and any of six line pairs for polarimetry. For further information see B. E. Woodgate et al., Solar Physics, v. 65, p. 73, 1980.

------- SMM, WILLSON---

INVESTIGATION NAME- ACTIVE CAVITY RADIOMETER IRRADIANCE MONITOR

NSSDC ID- 80-014A-08 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
ASTRONOMY

PERSONNEL

PI - R. C.	WILLSON	NASA-JPL

BRIEF DESCRIPTION

The objective [illegible] active cavity radiometer irradiance monitor (ACRIM) w[illegible]re the total solar irradiance with state-of-the-art ac[illegible]nd precision (<0.5%) in order to determine the magnitude and direction of variations in the total solar output of optical energy. Solar irradiance in the far ultraviolet was measured by three active cavity radiometer detectors, individually shuttered. These detectors were electrically self-calibrated, conical cavity pyroheliometers capable of defining the solar flux with an uncertainty of 0.1% and a precision of 0.2%. One detector was used routinely to monitor the sun, a second detector was intermittently exposed to the sun to establish the long-term stability of the first detector, and a third detector was used for resolving ambiguities in the performance of the first two detectors. For more information, see R. C. Willson, Applied Optics, v. 18, p. 179, 1979.

*************************** SPACE SHUTTLE LDEF 1**************

SPACECRAFT COMMON NAME- SPACE SHUTTLE LDEF 1
ALTERNATE NAMES- LONG DURATION EXPOS.FAC., LDEF
LDEF-A, 14898
LDEF 1/STS41C

NSSDC ID- 84-034B

LAUNCH DATE- 04/06/84 WEIGHT- 9710. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE-	GEOCENTRIC	EPOCH DATE-	04/07/84
ORBIT PERIOD-	94.2 MIN	INCLINATION-	28.5 DEG
PERIAPSIS-	473. KM ALT	APOAPSIS-	483. KM ALT

PERSONNEL

MG - R.	GUALDONI	NASA HEADQUARTERS
PM - L.P.	DASPIT, JR.	NASA-LARC
PS - W.H.	KINARD	NASA-LARC

BRIEF DESCRIPTION

The Long Duration Exposure Facility (LDEF) was developed by the NASA office of Aeronautics and Space Technology and the NASA/Langley Research Center to accommodate, using the Shuttle, a class of technology, science, and applications experiments that require a free-flying exposure in space and that benefit from postflight laboratory studies with the retrieved experiment hardware. The LDEF was a simple reusable structure approximately 4.3 m in diameter and 9.1 m in length. The experiments were contained in trays mounted to the structure. The LDEF had no central power or data system. It did, however, provide initiation and termination signals at the start and end of the mission. Any required power and/or data systems were included by the experimenter in his respective tray. Standard Experiment Power and Data Systems were designed for use in LDEF trays and these could be procured by the experimenters. The LDEF had a gravity-gradient stabilized orbit orientation. After a 12-month period in orbit, it was planned to retrieve the LDEF on a subsequent Shuttle flight. It is planned to regularly launch and recover LDEF at approximately yearly intervals. For additional information see L. G. Clark et al., "The long duration exposure facility (LDEF)," NASA SP-473, February 1984.

------- SPACE SHUTTLE LDEF 1, ADAMS, JR.-----------------------

INVESTIGATION NAME- HEAVY IONS IN SPACE

NSSDC ID- 84-034B-13 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - J.H.	ADAMS, JR.	US NAVAL RESEARCH LAB
PI - R.	SILBERBERG	US NAVAL RESEARCH LAB
PI - C.H.	TSAO	US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

Eight stacks of passive track detectors were used to investigate three components of heavy nuclei in space (low-energy N, O, and Ne nuclei; heavy nuclei of the Van Allen belts; and ultra-heavy nuclei, Z>30, of the galactic cosmic radiation). Lexan was used for the low-energy stacks and CR-39 plastic sheets were used for the cosmic-ray stacks. The instrumentation required two standard trays located on the earth-facing end of LDEF.

------- SPACE SHUTTLE LDEF 1, ALLEN----------------------------

INVESTIGATION NAME- BALLOON MATERIALS DEGRADATION

NSSDC ID- 84-034B-38 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

PI - D.H.	ALLEN	TEXAS A+M

BRIEF DESCRIPTION

The objective of this experiment was to assess the effects of long-term exposure of candidate balloon films, tapes, and lines to the space environment. The instrumentation included sixteen balloon material films, three seal tapes, and three lines, occupying one-third of a peripheral tray. It was planned to observe the degradation of mechanical and radiometric properties by a series of postflight tests on the exposed materials and on identical samples kept on the ground for comparison purposes.

------- SPACE SHUTTLE LDEF 1, ALSTON---------------------------

INVESTIGATION NAME- SEEDS IN SPACE EXPERIMENT

NSSDC ID- 84-034B-62 INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - J.A. ALSTON G.W. PARK SEED CO.
OI - G.B. PARK G.W. PARK SEED CO.

BRIEF DESCRIPTION
The objectives of this experiment were to evaluate the effects of space radiation on the survivability of seeds stored in space under sealed and vented conditions and to determine possible resulting mutants and changes in mutation rates. The experimental procedure was to expose approximately 2 million seeds of many varieties to space for 1 year and then return them to earth. It was planned to germinate the returned seeds along with control seeds of each variety which had not been exposed in space, and to study the germination rates and development of the plants. The seeds were packaged in Dacron bags and stored in both sealed and vented containers mounted in a peripheral tray. Layering of seeds within the container provided increasing shielding to lower layers of seeds. Radiation levels were measured by thin dosimeters placed between layers of seeds. Passive maximum-temperature indicators were also placed inside the container.

------- SPACE SHUTTLE LDEF 1, ANGELO, JR.----------------------

INVESTIGATION NAME- SPACE ENVIRONMENT EFFECTS

NSSDC ID- 84-034B-64 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J.A. ANGELO, JR. A.F. TECH. APPL. CTR.
OI - R.R. ALFANO CITY COLL.
OI - L.P. ALTADONNA PERKIN-ELMER
OI - V.L. CAPLAN CITY COLL.
OI - M.D. D'AGOSTINO GRUMMAN AEROSPACE CORP
OI - R.G. MADONNA A.F. TECH. APPL. CTR.
OI - J.Y. CHANG GRUMMAN AEROSPACE CORP

BRIEF DESCRIPTION
The primary purpose of this experiment was to examine the effects of long-term exposure to the near-earth space environment on advanced electro-optical and radiation sensor components. A secondary objective involved an exobiology experiment to observe the effect of long-duration spaceflight on the germination rate of selected terrestrial plant seeds. The approach of the main experiment was to measure the optical and electrical properties of the electro-optical and radiation sensor components before and after exposure to the space environment. The selected components being tested were mounted in a sealed experiment exposure control canister (EECC) which occupied one-third of an LDEF tray. The purpose of the sealed EECC was to prevent contamination of the test components during ground transportation to and from the launch site, payload processing at the launch complex, launch and landing. The EECC was programmed to open 2 weeks after deployment and close 1 week prior to anticipated retrieval. The second exobiology experiment involved a variety of terrestrial plant seeds enclosed in an aluminum alloy tube filled with dry air. Postflight germination rates of these seeds were to be compared to the germination rates of control seed samples kept on earth. Lithium fluoride radiation dosimeters were also included in the seed capsule to provide an approximate measure of total space radiation exposure within the capsule.

------- SPACE SHUTTLE LDEF 1, ASSIE---------------------------

INVESTIGATION NAME- MICROWELDING OF VARIOUS METALLIC
MATERIALS UNDER ULTRAVACUUM

NSSDC ID- 84-034B-56 INVESTIGATIVE PROGRAM
CODE R

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J.P. ASSIE AEROSPATIALE

BRIEF DESCRIPTION
The purpose of this experiment was to investigate microwelds that occur in the space environment as the result of molecular diffusion of spacecraft constituent metals. The experimental approach was to passively expose inert metal specimens to the space vacuum and to conduct end-of-mission verification of the significance of microwelds between various pairs of metal washers. The experiment was located in a peripheral tray that contained nine other experiments from France.

------- SPACE SHUTTLE LDEF 1, BEAUJEAN------------------------

INVESTIGATION NAME- MEASUREMENT OF HEAVY COSMIC-RAY NUCLEI
ON LDEF

NSSDC ID- 84-034B-59 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL
PI - R. BEAUJEAN U OF KIEL
OI - W. ENGE U OF KIEL
OI - G. SIEGMON U OF KIEL

BRIEF DESCRIPTION
The objective of this experiment was to measure the elemental and isotopic abundances of heavy cosmic-ray nuclei with nuclear charge Z equal to or greater than 3. The chemical and energy spectra were to be measured for particles that have energies in the range from 20 to 1000 MeV per atomic mass unit. Two points of great interest were "geomagnetically forbidden" cosmic-ray particles and heavy ions of the trapped radiation. The experiment was passive and it occupied one-sixth of an LDEF peripheral tray. The experiment package consisted of visual-track detectors that remained sensitive throughout the LDEF mission. The scientific data were to be stored in latent tracks and processed in the investigator's laboratory after recovery.

------- SPACE SHUTTLE LDEF 1, BENTON--------------------------

INVESTIGATION NAME- LINEAR ENERGY TRANSFER SPECTRUM
MEASUREMENT EXPERIMENT

NSSDC ID- 84-034B-60 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - E.V. BENTON U OF CALIF, SAN FRANC.
PI - T.A. PARNELL NASA-MSFC

BRIEF DESCRIPTION
The purpose of this experiment was to measure the linear energy transfer (LET) spectrum behind different shielding configurations for approximately 1 year. The LET is the energy deposited per unit path length of a charged particle traversing matter. The shielding was increased in increments of about 1 g/sq cm up to a maximum shielding of 16 g/sq cm. In addition to providing critical information to future spacecraft designers, these measurements should also provide extremely valuable data to other experiments on LDEF. A combination of thermal-luminescence and track-type detectors was used to measure the LET. Aluminum was used for the shielding. The passive detectors and shielding material were placed in a canister sealed with approximately 1-atm internal pressure. Control detectors identical to those flown were used to establish the terrestrial background radiation to which the flight detectors were exposed prior to launch and after recovery.

------- SPACE SHUTTLE LDEF 1, BERSET--------------------------

INVESTIGATION NAME- THIN METAL FILM AND EVAPORATED CATHODES
PERFORMANCE IN SPACE

NSSDC ID- 84-034B-40 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J.M. BERSET CNRS-LPSP
PI - J.P. DELABOUDINIERE CNRS-LPSP

BRIEF DESCRIPTION
This experiment was designed to test the space behavior of vacuum UV optical components (EUV thin films, UV gas filters, and UV crystal filters) and to provide data for the development and qualification of new components. The experimental approach was to passively expose these components to the space environment for postflight measurements and comparison with preflight measurements. The flight samples occupied a portion of a peripheral LDEF tray which also contained nine other experiments from France. The instrumentation provided protection for the samples during the launch and reentry phases of the LDEF mission.

------- SPACE SHUTTLE LDEF 1, BLUE----------------------------

INVESTIGATION NAME- EFFECTS OF LONG-DURATION EXPOSURE ON
ACTIVE OPTICAL SYSTEMS COMPONENTS

NSSDC ID- 84-034B-26 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - M.D. BLUE GEORGIA INST OF TECH
PI - J.J. GALLAGHER GEORGIA INST OF TECH
PI - R.G. SHACKELFORD GEORGIA INST OF TECH

BRIEF DESCRIPTION
The objectives of this experiment were to measure the effects of space exposure on the performance of lasers, radiation detectors, and other optical components. From the results obtained, it was planned to establish guides for component selection. The LDEF instrumentation included 128 electro-optical samples mounted in a peripheral tray. Passive thermal control was used to keep the samples within the temperature range -50 to +68 deg C. Thirty-five samples were maintained in the laboratory as a set of control samples. The experiment was passive and no electrical power was employed.

------- SPACE SHUTTLE LDEF 1, BOURRIEAU-----------------------

INVESTIGATION NAME- OPTICAL FIBERS AND COMPONENTS

NSSDC ID- 84-034B-43 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J. BOURRIEAU CERT/ONERA

BRIEF DESCRIPTION
The objective of this experiment was to examine the radiation effects on fiber optic waveguides which are used as important components in new communications systems, optoelectronic circuits and data links. Comparisons of radiation-induced damages in flight and during laboratory tests were to determine the validity of irradiation tests with radioactive sources. The experimental approach was to passively expose two optic fiber waveguides (one step index and one graded index) to the space environment for postflight measurements and comparison with preflight measurements. The flight samples occupied a portion of a peripheral LDEF tray which also contained nine other experiments from France. The instrumentation provided protection for the samples during the launch and reentry phases of the LDEF mission.

------- SPACE SHUTTLE LDEF 1, BRANDHORST, JR.-----------------

INVESTIGATION NAME- ADVANCED PHOTOVOLTAIC EXPERIMENT

NSSDC ID- 84-034B-02 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - H.W. BRANDHORST, JR. NASA-LERC
PI - A.F. FORESTIERI NASA-LERC

BRIEF DESCRIPTION
The objectives of this investigation were (1) to study the performance of advanced and conventional solar cells, (2) to improve reference standards for photovoltaic measurements, and (3) to measure the energy distribution in the extraterrestrial solar spectrum. The instrumentation was mounted in a standard LDEF tray and included a large number of samples provided by 15 different agencies. A standard LDEF Experiment Power and Data System was used to operate the experiment and record the data. The required power was provided by lithium-sulfur dioxide batteries. Daily measurements were plannned for the duration of the mission.

------- SPACE SHUTTLE LDEF 1, BUCKER--------------------------

INVESTIGATION NAME- FREE FLYER BIOSTACK

NSSDC ID- 84-034B-50 INVESTIGATIVE PROGRAM
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - H. BUCKER DFVLR

BRIEF DESCRIPTION
The experiment objective was to investigate the biological effect of the structured components of cosmic radiation during space flight, with emphasis on the effects of individual very heavy ions. Quantitative assessment of the hazards of heavy ion particles to man in space should help establish suitable protection guidelines for man and biological experiments in future space flights. The flight hardware was composed of biological specimens and nuclear track detectors. It was planned to correlate the biological and physical events by using a special sandwich construction of visual track detectors and monolayers of biological objects. The LDEF instrumentation consisted of 12 passive detector units mounted in a tray on the earth-facing end of the LDEF and 8 units mounted in one-third of a peripheral tray.

------- SPACE SHUTTLE LDEF 1, CALHOUN-------------------------

INVESTIGATION NAME- CASCADE VARIABLE CONDUCTANCE HEAT PIPE

NSSDC ID- 84-034B-39 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - L.D. CALHOUN MCDON-DOUG ASTRONAUT
PI - M.G. GROTE MCDON-DOUG ASTRONAUT

BRIEF DESCRIPTION
The objective of this experiment was to verify the capability of a cascade variable-conductance heat pipe system to provide precise temperature control of long-life spacecraft, without the need of a feedback heater or other power sources for temperature adjustment, under conditions of widely varying power input and space environment. The instrumentation consisted of two variable-conductance heat pipes connected in series and mounted in a peripheral tray. One pipe was for coarse control (+ or -3 deg C) and the other was for fine control (+ or -0.3 deg C). Solar energy was the heat source and space was the heat sink. The power and data system of experiment SSLDEF-12 (McIntosh) was used for data collection and recording. It was planned to collect data twice daily throughout the LDEF mission.

------- SPACE SHUTTLE LDEF 1, CALLEN--------------------------

INVESTIGATION NAME- SPACE TESTING OF HOLOGRAPHIC DATA STORAGE CRYSTALS

NSSDC ID- 84-034B-08 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - W.R. CALLEN GEORGIA INST OF TECH
PI - T.K. GAYLORD GEORGIA INST OF TECH

BRIEF DESCRIPTION
This experiment was designed to observe the effect of long space exposure on electro-optic crystals for use in ultra-high capacity space data storage and retrieval systems. The information obtained should help develop high-bit-capacity recorder and memory systems. The experimental approach was to expose passively four holographic data storage crystals, each 10 x 10 x 2 mm in size. The crystals for this experiment were located in the same peripheral tray as that used for Experiment 26 (Blue).

------- SPACE SHUTTLE LDEF 1, DEIASI--------------------------

INVESTIGATION NAME- EFFECTS OF SPACE ENVIRONMENT ON SPACE-BASED RADAR PHASED-ARRAY ANTENNA

NSSDC ID- 84-034B-20 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - R.J. DEIASI GRUMMAN AEROSPACE CORP
OI - F.J. KUEHNE GRUMMAN AEROSPACE CORP
OI - M.L. ROSSI GRUMMAN AEROSPACE CORP
OI - M. KESSELMAN GRUMMAN AEROSPACE CORP
OI - R.L. HEUER GRUMMAN AEROSPACE CORP

BRIEF DESCRIPTION
The objective of this experiment was to evaluate the effects of space environment on a wide range of structural polymeric materials being considered for the Grumman space-based radar phased-array antenna. The experiment provided quantitative data on the degradation caused by thermal cycling, ultraviolet and electron irradiation, applied load, and high-voltage plasma interaction. The specimens for this investigation were mounted in a corner tray divided into four quadrants. Three quadrants contained the passive parts of the experiment. The fourth quadrant contained the high-voltage part of the experiment.

------- SPACE SHUTTLE LDEF 1, ELBERG--------------------------

INVESTIGATION NAME- EFFECT OF SPACE EXPOSURE ON THERMAL AND MECHANICAL PROPERTIES OF EPOXY COMPOSITES

NSSDC ID- 8'-034B-54 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - R. ELBERG SPACE DIV., MATRA, S.A.

BRIEF DESCRIPTION
The main objective of this experiment was to detect a possible variation in the coefficient of thermal expansion of composite samples during a 1-year exposure to the near-earth orbital environment. A second objective was to detect a possible change in the mechanical integrity of composite products. A third objective was to compare the behavior of two epoxy resins commonly used in space structures. The experimental approach was to passively expose samples of epoxy matrix composite materials to the space environment and to compare preflight and postflight measurements of mechanical properties. The experiment was located in a peripheral tray that contained nine other experiments from France. The experiment container was designed to protect the samples from contamination during the launch and reentry phases of the LDEF mission.

------- SPACE SHUTTLE LDEF 1, FELBECK--------------------------

INVESTIGATION NAME- SPACE EXPOSURE INFLUENCE ON MECHANICAL PROPERTIES OF HI-TOUGHNESS GRAPHITE EPOXY

NSSDC ID- 84-034B-06

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - D.K. FELBECK U OF MICHIGAN

BRIEF DESCRIPTION
This experiment was designed to determine the effect of extended exposure to a space environment on the mechanical properties of a specially toughened T300/5208 graphite-epoxy composite material. Specimens made by recently developed techniques of intermittent interlaminar bonding were exposed and were to be tested after flight for (1) fracture toughness, (2) tensile strength, and (3) elastic modulus. The LDEF instrumentation consisted of test specimens occupying one-sixth of a peripheral LDEF tray.

------- SPACE SHUTTLE LDEF 1, GREENE--------------------------

INVESTIGATION NAME- LDEF THERMAL MEASUREMENT SYSTEM

NSSDC ID- 84-034B-57

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - R.F. GREENE NASA-LARC

BRIEF DESCRIPTION
The objectives of this experiment were to determine the history of the interior average temperatures of the LDEF for the total orbital mission and to measure the temperatures of selected components and thermal boundary conditions. The thermal measurement system consisted of six copper-constantan thermocouples, two thermistor reference measurements, an electronic system, one 7.5-V battery, and an interface harness with the low-temperature heat-pipe experiment (McIntosh). It was planned to record the temperature measurements about 12 times daily using a shared power and data system in the low-temperature heat pipe experiment package.

------- SPACE SHUTTLE LDEF 1, GREGORY--------------------------

INVESTIGATION NAME- THE INTERACTION OF ATOMIC OXYGEN WITH SOLID SURFACES AT ORBITAL ALTITUDES

NSSDC ID- 84-034B-19

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J.C. GREGORY U OF ALABAMA
PI - P.N. PETERS NASA-MSFC

BRIEF DESCRIPTION
The main objectives of this experiment were to determine the effects of high fluxes of atomic oxygen on various solid surfaces and to investigate the mechanisms of interaction. The basic approach to this experiment was to use a wide variety of materials, some not chemically affected by oxygen, and to alter the exposure, angle of incidence, and temperature of the substrates by their position on the LDEF spacecraft and by experiment design. The instrumentation consisted of two flight units, each occupying one-sixth of a peripheral LDEF tray. One unit was located on the leading edge of LDEF and the other unit was on the trailing edge. The flux of atomic oxygen is maximum on the leading edge and considerably smaller on the trailing edge. The samples on the trailing edge could thus serve as control samples.

------- SPACE SHUTTLE LDEF 1, GRIGSBY--------------------------

INVESTIGATION NAME- SPACE-EXPOSED EXPERIMENT DEVELOPED FOR STUDENTS (SEEDS)

NSSDC ID- 84-034B-63

INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - D.K. GRIGSBY NASA HEADQUARTERS

BRIEF DESCRIPTION
The objectives of this experiment were to involve a very large number of students in a national project to generate interest in science and related disciplines; to offer students from the elementary through the university level an opportunity to participate in a first-hand experiment with materials flown in space; and to permit active involvement in classroom experiment design, decision making, data gathering, and comparison of results. Approximately 11 to 12 million tomato seeds were stored in five sealed containers mounted in a peripheral tray. Within each sealed container, the seeds were packaged in four Dacron bags. Passive radiation detectors were placed inside the canisters. After exposure to the space environment, the seeds were to be returned to the George W. Park Seed Co., Inc., which was responsible for providing the seed kits. In addition to flight seeds, an equivalent amount of control seeds was maintained in ground storage facilities. Both sets of seeds were to be evaluated postflight to determine germination rates. It was planned to provide participating student groups with kits containing samples of both exposed and control seeds. The students were expected (1) to design and conduct their own classroom experiments, and (2) make their results available to the public, NASA, and the Park Seed Co.

------- SPACE SHUTTLE LDEF 1, HICKEY--------------------------

INVESTIGATION NAME- PASSIVE EXPOSURE OF EARTH RADIATION BUDGET EXPERIMENT COMPONENTS

NSSDC ID- 84-034B-27

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J.R. HICKEY EPPLEY LAB, INC
OI - F.J. GRIFFIN EPPLEY LAB, INC

BRIEF DESCRIPTION
Earth radiation budget (ERB) experiments require accuracies in solar and earth flux radiation measurements in fractional percentages. The experiment approach was to expose ERB channel components, to be followed by subsequent retrieval and resubmission to radiometric calibration. The information to be obtained was intended to indicate the corrections to be applied to ERB results, and to help select components for future solar and ERB experiments. The instrumentation included earth-flux channel components mounted in one-fourth of a tray on the earth-viewing end of the LDEF, and solar channel components mounted in one-sixth of a peripheral LDEF tray (in the direction of the velocity vector).

------- SPACE SHUTTLE LDEF 1, HORZ--------------------------

INVESTIGATION NAME- CHEMISTRY OF MICROMETEOROIDS

NSSDC ID- 84-034B-51

INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST

PERSONNEL
PI - F. HORZ NASA-JSC
PI - D.S. MCKAY NASA-JSC
PI - D.A. MORRISON NASA-JSC
OI - D.E. BROWNLEE U OF WASHINGTON
OI - R.M. HOUSLEY ROCKWELL INTL CORP

BRIEF DESCRIPTION
The objective of the experiment was to obtain chemical analyses of a statistically significant number of micrometeoroids. The experiment was also designed to provide information regarding the density, shape, and mass flux of these micrometeoroids. The LDEF instrumentation included both active and passive collection units. The active units occupied one standard peripheral LDEF tray in which a clam shell arrangement was used to protect the collection units during ground handling, launch, LDEF deployment and retrieval. The passive units occupied two standard peripheral LDEF trays. These provided no protection against contamination.

------- SPACE SHUTTLE LDEF 1, HUMES----------------------------

INVESTIGATION NAME- SPACE DEBRIS IMPACT STUDY

NSSDC ID- 84-034B-36 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - D.H. HUMES NASA-LARC

BRIEF DESCRIPTION
The objectives of this experiment were to determine the population and size distribution of meteoroids in the mass range from 10E-10 to 10E-4 g, to determine the current population of man-made debris in the same mass range, and to obtain data on physical properties (composition and density) of meteoroids. The experimental approach was to expose large areas of aluminum plates to the space environment. The LDEF instrumentation occupied 19 peripheral trays, plus 2 trays on the earth-facing end, and 1 tray on the space-facing end of the LDEF.

------- SPACE SHUTTLE LDEF 1, JOHNSTON-------------------------

INVESTIGATION NAME- FIBER OPTIC DATA TRANSMISSION EXPERIMENT

NSSDC ID- 84-034B-03 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - A.R. JOHNSTON NASA-JPL
PI - L.A. BERGMAN NASA-JPL

BRIEF DESCRIPTION
The purpose of this experiment was to determine long-term degradation of fiber optic data transmission links in the space environment. Fiber optic transmission lines are under consideration for future satellites because of their large bandwidths, lack of electromagnetic interference problems, low weight and cost, and safety. The instrumentation, which occupied one whole peripheral LDEF tray, was designed to test ten fiber links and three connector types under passive exposure to the space environment. Four fiber cables were mounted in a planar helix coil on a thermally isolated plate. Six additional cables were mounted on the bottom surface of the tray.

------- SPACE SHUTTLE LDEF 1, LARC STAFF----------------------

INVESTIGATION NAME- METEOROID DAMAGE TO SPACECRAFT

NSSDC ID- 84-034B-61 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - LARC STAFF NASA-LARC

BRIEF DESCRIPTION
The objective of this experiment was to obtain examples of meteoroid impact damage to typical spacecraft components, and by so doing to help establish design approaches to minimize meteoroid damage effects to future spacecraft. It was expected that the results of the complete inspection of the LDEF would complement and extend the data obtained from specific meteoroid experiments flying in LDEF trays. The planned procedure was to (1) examine all exposed external surfaces of LDEF and the experiments after retrieval but before any experiment tray removal operations are begun, (2) document the locations of impact craters, and (3) request the principal investigators of the trays containing impact craters to make the component containing the crater available for study after their evaluation of the item has been completed.

------- SPACE SHUTTLE LDEF 1, LIND----------------------------

INVESTIGATION NAME- GROWTH OF CRYSTALS FROM SOLUTIONS IN LOW GRAVITY

NSSDC ID- 84-034B-17 INVESTIGATIVE PROGRAM
CODE RS/CO-OP

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - M.D. LIND ROCKWELL INTER SCI CTR
PI - K.F. NIELSEN TECH U OF DENMARK

BRIEF DESCRIPTION
This experiment was designed to test a novel method for growing crystals from solutions. This method consisted of allowing two or more reactant solutions to diffuse slowly towards each other in a region of pure solvent in which they react to form single crystals of a desired substance. The crystals studied (PbS, CaCO3, TTF-TCNQ, and TSF-TCNQ) were of importance in research and technology. The experiment utilized specially designed reactors having three or more compartments separated by valves for keeping the reactant solutions and solvent separated until the apparatus reaches low gravity. The reactors were enclosed in a vacuum-tight container and surrounded by thermal insulation. The temperature was to be maintained at 35 deg C.

------- SPACE SHUTTLE LDEF 1, LIND----------------------------

INVESTIGATION NAME- INTERSTELLAR GAS

NSSDC ID- 84-034B-48 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL
PI - D.L. LIND NASA-JSC
OI - J. GEISS U OF BERNE
OI - F. BUEHLER U OF BERNE

BRIEF DESCRIPTION
The objective of this experiment was to analyze the interstellar helium and neon atoms which penetrate the heliosphere to the vicinity of the earth. By collecting these particles at several locations in the earth's orbit, it is possible to study the dynamics of the interstellar wind as it flows through the heliosphere and interacts with the solar photon flux and solar wind. The experiment hardware acted as a set of simple "cameras" with high-purity copper-beryllium collecting foils serving as the "film." The experiment housing provided thermal control, established viewing angles and viewing direction, rejected ambient particles, sequenced the collecting foils, and protected the foils during deployment and retrieval of the LDEF. The experiment used two peripheral trays and two trays on the space-facing end of the LDEF. Power was provided by lithium-sodium dioxide batteries.

------- SPACE SHUTTLE LDEF 1, MALHERBE------------------------

INVESTIGATION NAME- VACUUM-DEPOSITED OPTICAL COATINGS

NSSDC ID- 84-034B-41 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - A. MALHERBE MATRA/SFOM OPTICAL DIV

BRIEF DESCRIPTION
This experiment was designed to investigate the long-term stability of a wide range of vacuum-deposited optical coatings which are used in spacecraft optical and electro-optical instruments. The experimental approach was to passively expose these components to the space environment for postflight measurements and comparison with preflight measurements. The flight samples occupied a portion of a peripheral LDEF tray which also contained nine other experiments from France. The instrumentation provided protection for the samples during the launch and reentry phases of the LDEF mission.

------- SPACE SHUTTLE LDEF 1, MANDEVILLE----------------------

INVESTIGATION NAME- STUDY OF METEOROID IMPACT CRATERS ON VARIOUS MATERIALS

NSSDC ID- 84-034B-32 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST

PERSONNEL
PI - J.C. MANDEVILLE CERT/ONERA

BRIEF DESCRIPTION
The main goal of this experiment was to study impact craters produced by micrometeoroids on selected materials (metals and glasses in the form of thick targets). Interplanetary dust particles were expected to form well-defined craters upon impacting the exposed materials at very high velocity. The post-flight study of crater frequency and impact features was expected primarily to give data on the mass-flux distribution of micrometeoroids, and to a lesser extent provide velocity information. The LDEF instrumentation, which was entirely passive, was located in one-sixth of a peripheral tray that also contained nine other experiment from France.

------- SPACE SHUTTLE LDEF 1, MANDEVILLE-----------------------

INVESTIGATION NAME- ATTEMPT AT DUST DEBRIS COLLECTION WITH STACKED DETECTORS

NSSDC ID- 84-034B-33 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY
DUST

PERSONNEL
PI - J.C. MANDEVILLE CERT/ONERA

BRIEF DESCRIPTION
The primary aim of this experiment was to investigate the feasibility (for future missions) of using multilayer thin-film detectors to collect micrometeoroids, if not in their original shape then at least as fragments suitable for chemical analysis. The LDEF instrumentation consisted of targets made of one or two thin metal foils placed in front of a thicker plate. The experiment included 31 targets with a total sampling surface area of 240 sq cm. The samples were mounted in a peripheral tray that also contained nine other experiments from France.

------- SPACE SHUTTLE LDEF 1, MCDONNELL-----------------------

INVESTIGATION NAME- MULTIPLE FOIL MICROABRASION PACKAGE

NSSDC ID- 84-034B-31 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST

PERSONNEL
PI - J.A.M.MCDONNELL U OF KENT, CANTERBURY
OI - D.G. ASHWORTH U OF KENT, CANTERBURY
OI - W.C. CAREY U OF KENT, CANTERBURY
OI - R.P. FLAVILL U OF KENT, CANTERBURY
OI - R.C. JENNISON U OF KENT, CANTERBURY

BRIEF DESCRIPTION
The objective of this experiment was to measure the spatial distribution, size, velocity, and composition of microparticles in near-earth environment. The measuring technique was based upon the penetration of micrometer-thick multiple-foil arrays. The detectors were located in four one-third trays spaced at 90-deg intervals around the LDEF periphery and in two-thirds of a tray on the space-facing end of the LDEF.

------- SPACE SHUTTLE LDEF 1, MCINTOSH-----------------------

INVESTIGATION NAME- LOW-TEMPERATURE HEAT PIPE EXPERIMENT

NSSDC ID- 84-034B-12 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - R. MCINTOSH NASA-GSFC
PI - S. OLLENDORF NASA-GSFC
PI - C.R. MCCREIGHT NASA-ARC

BRIEF DESCRIPTION
This experiment was designed to evaluate the performance characteristics in the space environment of a thermal-diode heat pipe, a fixed-conductance transporter heat pipe, and a low-temperature phase change material. The instrumentation was a self-contained and thermally isolated package which fitted into a peripheral tray. A standard LDEF Experiment Power and Data System was used for data collection and recording. The recorded data were to be analyzed after flight.

------- SPACE SHUTTLE LDEF 1, MIRTICH, JR.-----------------------

INVESTIGATION NAME- ION-BEAM-TEXTURED AND COATED SURFACES

NSSDC ID- 84-034B-01 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - M.J. MIRTICH, JR. NASA-LERC

BRIEF DESCRIPTION
The objective of this experiment was to measure the effect of the Space Shuttle launch and near-earth space environment exposure on (1) the optical properties of ion-beam textured high-absorptance solar thermal control surfaces and (2) the optical and electrical properties of ion-beam-sputtered conductive solar thermal control surfaces. Verification of the durability of these surfaces is conducive to the acceptance of this technology on future Shuttle-launched space systems. The experimental approach was to passively expose 36 samples (representing a variety of materials and coatings) to all environments of the entire mission. The degradation was to be determined from a comparison between preflight and postflight characteristics.

------- SPACE SHUTTLE LDEF 1, MOREAU-----------------------

INVESTIGATION NAME- RULED AND HOLOGRAPHIC GRATINGS

NSSDC ID- 84-034B-42 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - G. MOREAU INSTRUMENT SA/JOBIN-Y

BRIEF DESCRIPTION
The objective of this experiment was to investigate the long-term stability of various ruled and holographic gratings which are used in spacecraft optical and electro-optical instruments. The experimental approach was to passively expose these components to the space environment for postflight measurements and comparison with preflight measurements. The flight samples occupied a portion of a peripheral LDEF tray which also contained nine other experiments from France. The instrumentation provided protection for the samples during the launch and reentry phases of the LDEF mission.

------- SPACE SHUTTLE LDEF 1, NICHOLS-----------------------

INVESTIGATION NAME- EFFECTS OF SOLAR RADIATION ON GLASSES

NSSDC ID- 84-034B-44 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - R.L. NICHOLS NASA-MSFC
PI - D.L. KINSER VANDERBILT U

BRIEF DESCRIPTION
The objective of this experiment was to determine the effects of solar radiation and the space environment on the optical, mechanical, and chemical properties of various glasses. The instrumentation included 68 cylindrical disk samples occupying one-sixth of a peripheral LDEF tray (where exposure to solar radiation was maximum) and 52 samples occupying one-fourth of a tray on the earth-facing end of LDEF (where exposure to solar radiation was minimum).

------- SPACE SHUTTLE LDEF 1, O'SULLIVAN-----------------------

INVESTIGATION NAME- HIGH RESOLUTION STUDY OF ULTRA HEAVY COSMIC RAYS

NSSDC ID- 84-034B-49 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - D. O'SULLIVAN DUBLIN INST ADV STUDY
PI - A. THOMPSON DUBLIN INST ADV STUDY
PI - C. O'CEALLAIGH DUBLIN INST ADV STUDY
PI - V. DOMINGO ESA-ESTEC
PI - K.P. WENZEL ESA-ESTEC

BRIEF DESCRIPTION
The experiment objective was to study charge and energy spectra of ultra-heavy cosmic-ray nuclei. Since the flux of ultra-heavy cosmic-ray nuclei is very small (of the order of 1 per sq m per day), the instrumentation required a large area-time exposure. Sixteen LDEF trays were used, each containing 12 stacks of passive nuclear track detectors. Both Lexan polycarbonate and CR-39 detectors were used. The resulting information was expected to assist in understanding the physical processes of cosmic-ray nuclei production and acceleration in interstellar space. Information concerning nucleosynthesis also was expected to be obtained.

------- SPACE SHUTTLE LDEF 1, OWEN-----------------------

INVESTIGATION NAME- TRANSVERSE FLAT PLATE HEAT PIPE PERFORMANCE

NSSDC ID- 84-034B-37 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J.W. OWEN NASA-MSFC
OI - F. EDELSTEIN GRUMMAN AEROSPACE CORP

BRIEF DESCRIPTION

The purpose of this experiment was to evaluate the long-term operation of a high-capacity, lightweight, transverse flat-plate heat pipe in a sustained zero-gravity environment. The experiment also tested the ability of the heat pipe to reprime in zero gravity. The LDEF instrumentation consisted of three transverse flat-plate heat pipe modules installed in a peripheral tray with a standard LDEF Experiment Power and Data System (EPDS) for data collection and recording. The EPDS power was provided by lithium-sulfur dioxide batteries. The experiment was designed to operate for three 13-hour periods, at 1 month, 3 months, and 6 months after launch.

------- SPACE SHUTTLE LDEF 1, PAILLOUS------------------------

INVESTIGATION NAME- THERMAL CONTROL COATINGS EXPERIMENT

NSSDC ID- 84-034B-34 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - A. PAILLOUS CERT/ONERA
PI - J.C. GUILLAUMON CNES/CST

BRIEF DESCRIPTION

The objective of this experiment was to examine the validity of ground simulations of the space environment for studies of degradation of thermal control coatings used on satellites. It was planned to compare sample degradations from both ground tests and flight tests. The instrumentation, consisting of 30 samples, was located with 9 other experiments from France in a peripheral tray. The samples were passively exposed to the space environment, but protected during launch and reentry phases. Upon completion of the mission it was planned to seal the sample container in space and keep it under vacuum until optical tests were completed on the ground.

------- SPACE SHUTTLE LDEF 1, PARCELIER-----------------------

INVESTIGATION NAME- EFFECT OF SPACE ENVIRONMENT ON COMPOSITE MATERIALS

NSSDC ID- 84-034B-55 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - M. PARCELIER AEROSPATIALE

BRIEF DESCRIPTION

The objective of this experiment was to test different types of materials (laminates, thermal coatings, and adhesives) to determine their actual useful lifetimes. The results were expected also to make it possible to integrate the histories of the thermal and mechanical characteristics into models of the composite structures. The experiment was passive and was located in a peripheral tray with nine other experiments from France. The experiment container was designed to protect the samples from contamination during the launch and reentry phases of the LDEF mission.

------- SPACE SHUTTLE LDEF 1, POWELL--------------------------

INVESTIGATION NAME- GRAPHITE-POLYMIDE AND GRAPHITE-EPOXY MECHANICAL PROPERTIES IN SPACE

NSSDC ID- 84-034B-35 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J.H. POWELL ROCKWELL INTL CORP
PI - D.W. WELCH ROCKWELL INTL CORP

BRIEF DESCRIPTION

The primary objective of the graphite-polyimide and graphite-epoxy testing experiment was to accumulate actual operational data in the space environment over long periods of time. These data were expected to help establish design criteria associated with mechanical properties of future lightweight space-oriented structural components. A secondary objective of the graphite-epoxy sandwich testing was to validate mechanical properties (knockdown factors) as applied to the design and analysis of the existing Space Shuttle graphite-epoxy payload bay doors. The LDEF instrumentation consisted of test specimens mounted in two peripheral trays. A duplicate set of matched specimens was tested on the ground to provide baseline data.

------- SPACE SHUTTLE LDEF 1, PREUSS--------------------------

INVESTIGATION NAME- CRITICAL SURFACE DEGRADATION EFFECTS ON COATINGS AND SOLAR CELLS

NSSDC ID- 84-034B-46 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - L. PREUSS MBB SPACE DIV

BRIEF DESCRIPTION

The objectives of this experiment were (1) to investigate the combined effects of radiation and contamination on different thermal coatings and solar cells with and without conductive layers; and (2) to provide design criteria, design techniques, and test methods to ensure control of combined space and spacecraft environmental effects. This experiment also provided qualifications for a number of new coatings and solar cells. The instrumentation included both active and passive test samples mounted in a standard LDEF tray. An experiment exposure-control canister was used to limit the exposure of some samples to space and spacecraft environment only.

------- SPACE SHUTTLE LDEF 1, RICH----------------------------

INVESTIGATION NAME- TRAPPED-PROTON ENERGY SPECTRUM DETERMINATION

NSSDC ID- 84-034B-58 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - F.J. RICH USAF GEOPHYS LAB
OI - G.J. FISHMAN NASA-MSFC
OI - C.E. LAIRD EASTERN KENTUCKY U.
OI - P.J. MCNULTY CLARKSON COLL OF TECH
OI - Y.V. RAO EMMANUEL COLLEGE
OI - P.L. SEGALYN AMM RES. CTR.

BRIEF DESCRIPTION

The objective of this experiment was to measure the flux and energy spectrum of protons with energies of 1 to 10 MeV. These protons were trapped on the earth's magnetic field lines as part of the inner radiation belt. The protons were encountered predominantly in the South Atlantic anomaly at a 90-deg pitch angle. The experiment consisted of 18 stacks of passive plastic detectors (CR-39) arranged in portions of three LDEF trays. The stacks were mounted in containers on a plate arranged in the trays to be normal to the earth's magnetic field in the South Atlantic anomaly. Three passive subexperiments were also included which had different but related goals. The purpose of the first subexperiment was to measure the radioactivity induced by protons and neutrons in the LDEF orbit. The experimental approach was to expose metal samples to the ambient flux through the mission duration and to measure resulting gamma-ray activation spectra in a low-level counting facility after recovery. The second subexperiment used small microspheres to record the energy deposited in volume elements with microscopic dimensions as a result of exposure to the natural radiation environment of space. The third subexperiment used an ion-trapping technique to measure the flux of energetic particles.

------- SPACE SHUTTLE LDEF 1, ROBERTSON-----------------------

INVESTIGATION NAME- EFFECT OF SPACE EXPOSURE ON PYROELECTRIC INFRARED DETECTORS

NSSDC ID- 84-034B-18 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J.B. ROBERTSON NASA-LARC
OI - I.O. CLARK NASA-LARC
OI - R.K. CROUCH NASA-LARC

BRIEF DESCRIPTION

The objective of this experiment was to determine the effects of long-duration space exposure and launch environment on the performance of infrared pyroelectric detectors. Performance parameters (responsivity, detectivity, and spectral response) and materials properties (pyroelectric coefficient and dielectric loss tangent) were to be measured before and after exposure. The detectors for this experiment were included with the various components of Experiment 26 (Blue) and located in the same experiment tray.

------- SPACE SHUTTLE LDEF 1, SCHALL--------------------------

INVESTIGATION NAME- SPACE ENVIRONMENT EFFECTS ON SPACECRAFT MATERIALS

NSSDC ID- 84-034B-15 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - P. SCHALL AEROSPACE CORP

BRIEF DESCRIPTION
The purpose of this experiment was to investigate changes in the properties and structure of materials specimens after exposure to space environment. In general the experimental approach involved the comparison of preflight and postflight analyses. The specimens included various structural materials, solar power components, thermal control materials, laser communication components, laser mirror coatings, laser-hardened materials, antenna materials, and advanced composites. The investigation consisted of 19 subexperiments involving a number of DOD laboratories and DOD-contractor organizations. The instrumentation required four peripheral trays for the test specimens, two standard LDEF Experiment Power and Data Systems, two experiment exposure control canisters, and lithium-sulfur dioxide batteries.

------- SPACE SHUTTLE LDEF 1, SCOTT, JR.-----------------------

INVESTIGATION NAME- ATOMIC OXYGEN STIMULATED OUTGASSING

NSSDC ID- 84-034B-07 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - R.L. SCOTT, JR. SOUTHERN U
PI - R.C. LINTON NASA-MSFC

BRIEF DESCRIPTION
The purpose of this experiment was to investigate the effect of oxygen impingement on thermal control surfaces in near-earth orbit with regard to the production of optically damaging outgassing products. The experimental approach was to measure bidirectional reflectance of selected coatings before and after space exposure. These data were expected to help determine if atomic oxygen impingement was a major factor in unexplained Skylab contamination by providing an understanding of the effect of atomic oxygen on thermal control surfaces. The test samples were located in two packages, each occupying one-sixth of an exposure tray. One package was positioned on the leading (ram) edge of the LDEF, where it received maximum exposure to oxygen. The other package was located on the trailing edge, where it received minimum exposure to ambient oxygen.

------- SPACE SHUTTLE LDEF 1, SEELEY---------------------------

INVESTIGATION NAME- HIGH-PERFORMANCE INFRARED MULTILAYER FILTERS-RADIATION EFFECTS

NSSDC ID- 84-034B-23 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J.S. SEELEY READING U
PI - A. WHATLEY READING U
PI - R. HUNNEMAN READING U
OI - D.R. LIPSCOMBE BRITISH AEROSPACE CORP

BRIEF DESCRIPTION
The objective of the multilayer filters experiment was to expose high-performance infrared multilayer filters to the space environment and recover them for subsequent analysis and comparison with laboratory control samples. Semiconductors, such as PbTe, Si, and Ge were to be investigated for evidence of degradation. It was also planned to examine ZnS and other dielectrics after flight for evidence of degradation. The materials technology experiment was designed to evaluate the degradation of spacecraft surface finishes. The experiment required only one-sixth of a peripheral tray and one-fourth of a tray on the earth-facing end of the LDEF.

------- SPACE SHUTTLE LDEF 1, SINGER---------------------------

INVESTIGATION NAME- INTERPLANETARY DUST

NSSDC ID- 84-034B-52 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST

PERSONNEL
PI - S.F. SINGER U OF VIRGINIA
PI - P.C. KASSEL, JR. NASA-LARC
PI - J.E. STANLEY U OF VIRGINIA
PI - J.J. WORTMAN NORTH CAROLINA STATE U

BRIEF DESCRIPTION
The objective of this experiment was to measure impact rates and directions of solid particles, with some discrimination as to their mass and velocity in low-earth orbit. The instrumentation consisted of six groups of detectors mounted on the LDEF, permitting the detection of dust impacting from all directions. The total active area of the detectors was about 1 sq m. The instrumentation occupied two full LDEF trays and four partial (one-third) trays. A standard LDEF Experiment Power and Data System was used to record the impact data.

------- SPACE SHUTTLE LDEF 1, SLEMP----------------------------

INVESTIGATION NAME- EXPOSURE OF SPACECRAFT COATINGS

NSSDC ID- 84-034B-05 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - W.S. SLEMP NASA-LARC

BRIEF DESCRIPTION
This experiment was designed to determine the effects of space exposure on new coatings being developed for spacecraft thermal control. Samples of paints, other coatings, and second-surface mirrors were exposed; some to all environments of the mission and some to only specific environments. An exposure control canister was used to protect some of the test samples from exposure to launch and reentry environments. The instrumentation occupied one-half of a peripheral LDEF tray.

------- SPACE SHUTTLE LDEF 1, SLEMP----------------------------

INVESTIGATION NAME- SPACE EXPOSURE OF COMPOSITE MATERIALS FOR LARGE SPACE STRUCTURES

NSSDC ID- 84-034B-21 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - W.S. SLEMP NASA-LARC

BRIEF DESCRIPTION
The objective of this experiment was to evaluate the effects of the near-earth orbital environment on the physical and chemical properties of various composite materials. This investigation was aimed at determining the suitability of these materials for long-duration missions lasting 10 to 30 years. The experiment, which was passive, occupied one-half of a peripheral LDEF tray. The planned investigation included also a series of ground-based tests to help isolate the effects of UV, vacuum and time exposure on the flight specimens.

------- SPACE SHUTTLE LDEF 1, TAYLOR---------------------------

INVESTIGATION NAME- SPACE PLASMA HIGH-VOLTAGE DRAINAGE

NSSDC ID- 84-034B-09 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - W.W.L.TAYLOR TRW SYSTEMS GROUP
PI - G.K. KOMATSU TRW SYSTEMS GROUP

BRIEF DESCRIPTION
This experiment was flown to determine the long-term current drainage properties of thin dielectric films subjected to high-level electric stress in the presence of the ambient plasma and solar radiation. The observed behavior of these films should help establish allowable long-term electric stress levels for such films, as applied to solar array and spacecraft thermal control coating materials. The instrumentation consisted of a large number of dielectric samples, each having an associated battery and power processing unit, with the exception of "spectator" samples that were not electrically stressed in flight. The instrumentation occupied two peripheral trays, one near the LDEF leading edge and one near the LDEF trailing edge.

------- SPACE SHUTTLE LDEF 1, TAYLOR---------------------------

INVESTIGATION NAME- SPACE ENVIRONMENT EFFECTS ON FIBER OPTICS SYSTEMS

NSSDC ID- 84-034B-16 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - E.W. TAYLOR   USAF WEAPONS LAB

BRIEF DESCRIPTION
The objectives of this investigation were to qualify fiber optic links for future space applications, and to document and analyze the effect of the natural space environment on link and component performance. The instrumentation was located in a peripheral LDEF tray and was composed of nine distinct experiments, consisting of both active and passive data links or components. The data rate for the active links was 10 megabits/s. Measurements planned in flight included bit error and fiber attenuation, in addition to fiber temperature and tray volume temperature. A standard LDEF Experiment Power and Data System was used to perform the active experiments.

------- SPACE SHUTTLE LDEF 1, TENNYSON------------------------

INVESTIGATION NAME- PROPERTIES OF POLYMER-MATRIX COMPOSITE MATERIALS, EFFECT OF SPACE ENVIRONMENT

NSSDC ID- 84-034B-24   INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - R.C. TENNYSON   U OF TORONTO
PI - J.S. HANSEN   U OF TORONTO

BRIEF DESCRIPTION
The objective of this experiment was to qualify various polymer-matrix composite materials for future spacecraft applications. The instrumentation was designed to measure the effects of various times of exposure to the space environment upon the mechanical properties of several lightweight composite materials, including graphite, boron, S-glass, and PRD-49. Planned measurements included property degradation caused by matrix breakdown, outgassing, thermal stresses, and internal void cracks. Actual specimen test results from space were to be correlated with ground test data at ambient conditions and in a thermal-vacuum chamber. The LDEF instrumentation consisted of test specimens occupying one-half of a peripheral tray.

------- SPACE SHUTTLE LDEF 1, VENABLES------------------------

INVESTIGATION NAME- RADIATION SENSITIVITY OF QUART CRYSTAL OSCILLATORS EXPERIMENT

NSSDC ID- 84-034B-22   INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J.D. VENABLES   MARTIN-MARIETTA LABS
PI - J.S. AHEARN   MARTIN-MARIETTA LABS

BRIEF DESCRIPTION
This experiment was designed to measure the radiation sensitivity of quartz-crystal oscillators. By measuring the frequency drift of these resonators before and after flight, and the frequency offset occurring during the flight, the drift caused by space radiation was to be determined. The effects of exposure to an orbital radiation environment were to be compared with results of ground tests using a transmission electron microscope. Data obtained from LDEF and ground experiments were to provide guides to improve the radiation hardness of these components. The LDEF instrumentation occupied one-sixth of a peripheral tray and consisted of 10 quartz resonators exposed to space radiation and four resonators shielded from radiation.

------- SPACE SHUTTLE LDEF 1, WHITAKER------------------------

INVESTIGATION NAME- SOLAR-ARRAY MATERIALS (PASSIVE)

NSSDC ID- 84-034B-45   INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - A.F. WHITAKER   NASA-MSFC
OI - C.F. SMITH, JR.   NASA-MSFC
OI - L.E. YOUNG   NASA-MSFC
OI - H.W. BRANDHORST, JR.   NASA-LERC
OI - A.F. FORESTIERI   NASA-LERC
OI - E.M. GADDY   NASA-GSFC
OI - J.A. BASS   NASA-GSFC
OI - P.M. STELLA   NASA-JPL

BRIEF DESCRIPTION
The objective of this experiment was to determine the effects of space on mechanical, electrical, and optical properties of candidate lightweight solar-array materials such as those needed for a space station, a satellite power station, and solar electric propulsion solar arrays. Data obtained on the combined effects of the space environment on these material properties were to allow spacecraft manufacturers to design solar arrays with more predictable lifetimes. This investigation was passive. The LDEF instrumentation consisted of a large number of NASA-supplied samples mounted in a peripheral tray. Over two-thirds of the tray was occupied by MSFC samples. The remaining space was occupied by samples from LeRC, GSFC, and JPL.

------- SPACE SHUTTLE LDEF 1, WILKES--------------------------

INVESTIGATION NAME- THERMAL CONTROL SURFACES

NSSDC ID- 84-034B-04   INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - D.R. WILKES   NASA-MSFC
PI - H.M. KING   NASA-MSFC

BRIEF DESCRIPTION
The purpose of this experiment was to determine the effects of space exposure on new coatings developed for spacecraft thermal control. The experiment was designed to test 25 "active" samples (in calorimeter assemblies) and 24 "passive" samples. All samples (active and passive) were mounted on an indexing wheel (carousel). The carousel had an IN (or protected) and an OUT (or exposed) position. The samples were kept in the OUT position 23.5 h each day, and in the IN position 0.5 h per day. The IN position was used for emittance measurements and also for protection during launch, reentry, and the early flight period. The instrumentation included also a reflectometer designed to measure the reflectance of the "active" samples 20 times during the LDEF mission. This experiment occupied one peripheral LDEF tray.

************************** STP P78-1 ***********************

SPACECRAFT COMMON NAME- STP P78-1
ALTERNATE NAMES- SPACE TEST PROGRAM P78-1, P78-1
11278, SOLWIND

NSSDC ID- 79-017A

LAUNCH DATE- 02/24/79   WEIGHT- 849.6 KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY
UNITED STATES   DOD-USAF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC   EPOCH DATE- 02/24/79
ORBIT PERIOD- 96.3 MIN   INCLINATION- 97.9 DEG
PERIAPSIS- 560. KM ALT   APOAPSIS- 600. KM ALT

PERSONNEL
PM - J.T. VIOLA   USAF SPACE DIVISION
PS - H.E. WANG   AEROSPACE CORP

BRIEF DESCRIPTION
The Space Test Program (STP) P78-1 mission was designed to obtain scientific data from earth and sun-oriented experiments. The spacecraft was sun-oriented and had its spin axis perpendicular to both the orbital plane and the satellite-sun line. The instrumentation consisted of (1) a gamma-ray spectrometer and particle detectors, (2) a white-light coronagraph and an extreme-ultraviolet heliograph, (3) a solar X-ray spectrometer and spectroheliograph, (4) an extreme-ultraviolet spectrometer, (5) a high-latitude particle spectrometer, (6) an X-ray monitor, and (7) a preliminary aerosol monitor.

------- STP P78-1, BOWYER-----------------------------------

INVESTIGATION NAME- EXTREME ULTRAVIOLET SPECTROMETER

NSSDC ID- 79-017A-04   INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
AERONOMY
IONOSPHERES

PERSONNEL
PI - C.S. BOWYER   U OF CALIF, BERKELEY

BRIEF DESCRIPTION

This investigation used an extreme-ultraviolet spectrometer to measure airglow radiation in the upper atmosphere. The instrument had a 6- by 6-deg field of view and measured spectra in a selected 600-A bandwidth, with 5-A resolution, within the 200- to 1400-A range.

------- STP P78-1, IMHOF -------

INVESTIGATION NAME- GAMMA RAY SPECTROMETER

NSSDC ID- 79-017A-01

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY
PARTICLES AND FIELDS

PERSONNEL
PI - W.L. IMHOF — LOCKHEED PALO ALTO

BRIEF DESCRIPTION

This investigation used gamma-ray spectrometers to measure the distribution of gamma-ray sources and the characteristics of energetic particle fluxes at low altitudes. The instrument consisted of twelve independent spectrometers of three different types. There were two germanium spectrometers, two CsI/plastic Phoswich spectrometers, and an array of eight CdTe spectrometers. Each germanium spectrometer consisted of a large (85-cc) high-purity intrinsic germanium detector which was shielded with a NaI anticoincidence scintillator and cooled by a mechanical refrigerator. Each germanium detector had a conical FOV of 45-deg half-angle and a 15-sq-cm front area, and it measured energy loss from 40 keV to 2.5 MeV in 4096 channels. A factor-of-3 gain change allowed the range to change to 0.12 to 7.5 MeV. The initial energy resolution was 3.5 keV at 1 MeV, but due to radiation damage and temperature cycling caused by the necessity to turn off the refrigerator for power conservation the resolution degraded to about 40 keV at the 0.511-MeV line. The Phoswich spectrometers were 10.16-cm diameter disks of 1.27-cm thickness; they measured energy loss from 40 keV to 2.5 MeV in 256 channels. The FOVs of the CdTe spectrometers were fan-shaped in two dimensions with opening angles of 90 deg and 10 deg and had the 10-deg openings equally spaced in the S/C plane of rotation. The energy loss range was 20 to 200 keV in six channels.

------- STP P78-1, MCKENZIE -------

INVESTIGATION NAME- SOLAR X-RAY SPECTROMETER

NSSDC ID- 79-017A-03

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - D.L. MCKENZIE — AEROSPACE CORP
PI - R.W. KREPLIN — US NAVAL RESEARCH LAB
OI - G.A. DOSCHEK — US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

This investigation was composed of four parts: Solex, Solflex, Monex, and Magmap. The objective of these four experiments was the study of solar flares and active regions. Solex obtained spectra in the 3- to 25-A wavelength interval while pointed at a specific solar region, as well as maps of the sun in individual X-ray spectral lines using multigrid collimators and Bragg crystal spectrometers. Solflex obtained flare spectra in four narrow-wavelength bands between 1.8 and 8.6 A using uncollimated Bragg crystal spectrometers. Monex recorded full solar-disk intensity with 32-ms time resolution from 0.1 to 12 A using uncollimated proportional counters. Magmap obtained full-disk solar maps from 8 to 12 A using filtered collimated proportional counters.

------- STP P78-1, MICHELS -------

INVESTIGATION NAME- SOLAR WIND MONITOR

NSSDC ID- 79-017A-02

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - D.J. MICHELS — US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

This investigation used a white-light coronagraph and an extreme ultraviolet heliograph to monitor the sun's inner and outer corona. The purpose of the investigation was to determine the character of the plasma outflow at the source of the solar wind. The investigation also measured the form and structure of solar flares, coronal holes, and Alfven waves. Due to background light problems, the EUV heliograph data were completely compromised.

------- STP P78-1, PEPIN -------

INVESTIGATION NAME- PRELIMINARY AEROSOL MONITOR

NSSDC ID- 79-017A-07

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - T.J. PEPIN — U OF WYOMING

BRIEF DESCRIPTION

This investigation used an aerosol-monitoring instrument to measure the concentration and vertical distribution of aerosols and ozone in the earth's stratosphere.

------- STP P78-1, SHULMAN -------

INVESTIGATION NAME- X-RAY MONITOR

NSSDC ID- 79-017A-06

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL
PI - S.D. SHULMAN(NLA) — US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

This investigation used an X-ray monitor to determine the frequency and location of short-lived X-ray bursts from space. It provided a low-resolution mapping capability for auroral X-ray emission.

------- STP P78-1, VANCOUR -------

INVESTIGATION NAME- HIGH LATITUDE PARTICLE SPECTROMETER

NSSDC ID- 79-017A-05

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - R.P. VANCOUR — USAF GEOPHYS LAB

BRIEF DESCRIPTION

This investigation used two sets of dual electrostatic analyzers at right angles to acquire electron data in high-latitude auroral zones, primarily during magnetic storm and substorm periods. One analyzer in each set swept through the energy range 50 to 1000 eV, while the other analyzer swept from 1 to 20 keV simultaneously. The total energy range, 0.05 to 20 keV, was divided into 16 channels.

************************** STP P78-2 **************************

SPACECRAFT COMMON NAME- STP P78-2
ALTERNATE NAMES- SESP P78-2A, P78-2
SCATHA, 11256

NSSDC ID- 79-007A

LAUNCH DATE- 01/30/79 — WEIGHT- 343. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES — DOD-USAF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 04/29/79
ORBIT PERIOD- 1416.2 MIN — INCLINATION- 7.7 DEG
PERIAPSIS- 27553. KM ALT — APOAPSIS- 43239. KM ALT

PERSONNEL
PM - J.T. VIOLA — USAF SPACE DIVISION

BRIEF DESCRIPTION

Spacecraft Charging At High Altitudes (SCATHA) was a spacecraft program for measuring the characteristics of the plasmasheath charging process. This program determined the response of the spacecraft to the charging and evaluated the techniques to correct the problem. The spacecraft was essentially a right circular cylinder, 1.7 m in diameter and 1.8 m high. It had a near-synchronous orbit and spun about the cylinder axis at a rate of 1 rpm. The spin vector was normal to the earth-sun line and in the equatorial plane of the earth. There were three 3-m booms, a 2-m, and a 7-m boom, all for deployment of experiments. In addition, there was a 100-m tip-to-tip electric field antenna. An electron gun and a positive ion (xenon) gun were included, to test the control of the spacecraft potential. Telemetry capability was both PCM and FM, and data could be stored up to 12 h using onboard tape recorders. The planned mission lifetime of 1 year has been surpassed.

------- STP P78-2, AGGSON---

INVESTIGATION NAME- ELECTRIC FIELD DETECTOR

NSSDC ID- 79-007A-05   INVESTIGATIVE PROGRAM
                            CODE EE/CO-OP, SCIENCE

                            INVESTIGATION DISCIPLINE(S)
                            PARTICLES AND FIELDS
                            IONOSPHERES
                            SPACE PLASMAS
                            MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - T.L. AGGSON   NASA-GSFC

BRIEF DESCRIPTION
This experiment (SC10) measured the absolute potential between the satellite and the plasma using a 100-m tip-to-tip dipole antenna. The antenna elements were copper-beryllium stem extendable antennas and were 0.64-cm diameter tubes when extended. Two 50-m elements plus the 1.7-m spacecraft body made the total length 101.7 m. The antenna elements were insulated except for 20 m at the ends. Thus, for ambient plasma conditions, the conducting segments of the antenna were positioned outside the sheath region. The experiment measured dc electric fields from 0.1 to 20 mV/m and ac fields in the frequency range from 3 to 200 Hz from 1 to 100 microvolts/m.

------- STP P78-2, BLAKE---

INVESTIGATION NAME- ENERGETIC PROTON DETECTOR

NSSDC ID- 79-007A-14   INVESTIGATIVE PROGRAM
                            SPACE TEST PROGRAM

                            INVESTIGATION DISCIPLINE(S)
                            PARTICLES AND FIELDS
                            MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - J.B. BLAKE   AEROSPACE CORP

BRIEF DESCRIPTION
This experiment (SC2-6) used a two-element solid-state-detector telescope and measured the proton flux in the energy range from 17 to 717 keV in six differential channels plus integral fluxes for energies above 0.7 and 3.3 MeV.

------- STP P78-2, COHEN---

INVESTIGATION NAME- ELECTRON GUN-ION GUN

NSSDC ID- 79-007A-07   INVESTIGATIVE PROGRAM
                            SPACE TEST PROGRAM

                            INVESTIGATION DISCIPLINE(S)
                            MAGNETOSPHERIC PHYSICS
                            TECHNOLOGY
                            SPACE PLASMAS
                            PARTICLES AND FIELDS

PERSONNEL
PI - H.A. COHEN   USAF GEOPHYS LAB

BRIEF DESCRIPTION
This experiment (SC4) consisted of an electron-beam system (EBS) and a positive-ion-beam system (PIBS), which were flown to control the ejection, respectively, of negative charge (electrons) and positive charge (xenon ions) from the spacecraft. The EBS consisted of a control grid and an indirectly heated oxide-covered cathode, which was kept at a controlled negative potential with respect to the space vehicle. The controlled negative potential determined the energy of ejected electrons and varied in steps as follows: 50, 150, 300, 500, 1500, and 3000 V. The control grid was normally kept negative with respect to the cathode and was pulsed positively to allow electron ejection current. The duration and electron-current level of the pulse were controlled by ground command. A focusing element between the control grid and the grounded exit anode served to reduce the beam divergence. The magnitude of the beam current could vary over six steps (0.001, 0.01, 0.10, 1.0, 6.0, and 13 mA). The maximum power drawn was 42 W. Mounted in bonded electrical contact with the spacecraft frame ground, the EBS was oriented so that the beam axis was perpendicular to the spacecraft spin axis. A protective aperture cover was removed by ground command when the spacecraft was in orbit. The PIBS consisted of a Penning discharge-chamber ion source and a control grid. The ion source consisted of an ionization chamber and beam formation electrodes. A cylinder of pressurized xenon constituted the gas source and was controlled by a leak valve with the flow rate commandable from the ground. The intensity and duration of the ion beam was also determined by ground command. The two beam bias voltages were 1000 and 2000 V dc, and the five selectable beam intensity levels were 0.3, 0.5, 1.0, 1.5, and 2.0 mA. During maximum beam ejection, the power drawn was 50 W. The PIBS nozzle was the element that controlled the nature of the ejected beam, and the thin wires mounted on top of the nozzle could neutralize all or a fraction (including zero) of the beam, depending on satellite experiment requirements. The expellant storage tank was connected to the ion source through a pressure regulator, a solenoid-operated latch, a porous plug, and an insulator. The ion source was maintained under vacuum and opened to the atmosphere in orbit on command.

------- STP P78-2, FENNELL---

INVESTIGATION NAME- SPACECRAFT SHEATH FIELDS DETECTOR

NSSDC ID- 79-007A-06   INVESTIGATIVE PROGRAM
                            SPACE TEST PROGRAM

                            INVESTIGATION DISCIPLINE(S)
                            PARTICLES AND FIELDS
                            SPACE PLASMAS
                            MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - J.F. FENNELL   AEROSPACE CORP

BRIEF DESCRIPTION
This experiment (SC2-1, 2, and 3) consisted of three miniature electrostatic analyzers. Two of the analyzers were separately enclosed within 17.8-cm diameter spherical probes mounted on diametrically opposed 3-m booms. The third analyzer was mounted behind the center band of the spacecraft. The three analyzers had the same look directions and entrance angles so that, if there were no electric fields about the spacecraft, all three analyzers would measure the same flux, spectrum, and angular distribution of electrons and ions in the energy range 1 to 1000 eV. An optical data-transmission system was used to transmit digital data from the analyzers to the spacecraft data-processing system to maintain electrical isolation at the analyzers. The experiment also measured the floating potential of the spherical probes relative to the spacecraft reference point over a large dynamic range. The spherical probes could be biased relative to the spacecraft upon ground command. Potential and electric field measurements at three positions in the plasma sheath were obtained.

------- STP P78-2, HALL---

INVESTIGATION NAME- QUARTZ CRYSTAL MICROBALANCES IN RETARDING POTENTIAL ANALYZERS

NSSDC ID- 79-007A-03   INVESTIGATIVE PROGRAM
                            SPACE TEST PROGRAM

                            INVESTIGATION DISCIPLINE(S)
                            TECHNOLOGY

PERSONNEL
PI - D.F. HALL   AEROSPACE CORP

BRIEF DESCRIPTION
In this experiment (part of ML12), two quartz-crystal microbalances were placed in retarding potential analyzers, and used to measure contaminant mass deposition rates. One microbalance-analyzer set was mounted on the spacecraft side, and the other set was placed on a spacecraft end maintained in continuous shadow. The retarding potential analyzer was used to exclude ions from the microbalance and to maintain a zero-electric-field condition at the sensor. To determine dependence of contamination rate upon surface charg[illegible] measurements were made with and without the retarding-potential bias. The quartz sensors had an active temperature control and could be operated over a range of temperatures from -60 to +60 deg C.

------- STP P78-2, HALL---

INVESTIGATION NAME- THERMAL CONTROL SAMPLE MONITOR

NSSDC ID- 79-007A-04   INVESTIGATIVE PROGRAM
                            SPACE TEST PROGRAM

                            INVESTIGATION DISCIPLINE(S)
                            TECHNOLOGY

PERSONNEL
PI - D.F. HALL   AEROSPACE CORP

BRIEF DESCRIPTION
This experiment (part of ML12) evaluated the performance of thermal-control materials as a function of orbit contamination conditions. The sensor measured the backface temperature of eight thermal-control-material samples. The instruments were positioned contiguously with the quartz crystal monitors (79-007A-03). It was possible to heat some of the samples and to purge contaminants which froze out on the test surface.

------- STP P78-2, HARDY---

INVESTIGATION NAME- RAPID SCAN PARTICLE DETECTOR

NSSDC ID- 79-007A-12   INVESTIGATIVE PROGRAM
                            SPACE TEST PROGRAM

                            INVESTIGATION DISCIPLINE(S)
                            PARTICLES AND FIELDS
                            SPACE PLASMAS
                            MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - D.A. HARDY USAF GEOPHYS LAB

BRIEF DESCRIPTION
This experiment (SC5) employed curved-plate electrostatic analyzers and solid-state spectrometers to measure the flux of electrons and ions. The experiment recorded a spectrum for both electrons and ions once per second in two orthogonal directions. The electron flux was measured in 16 energy ranges spanning 50 eV to 1.1 MeV. The ion flux was measured in 18 energy ranges spanning 50 eV to 35 MeV. Any given energy channel could be read out with a time resolution of 240 microseconds.

------- STP P78-2, JOHNSON--

INVESTIGATION NAME- ENERGETIC ION SPECTROMETER

NSSDC ID- 79-007A-13 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - R.G. JOHNSON OF. OF SCI&TECH POLICY

BRIEF DESCRIPTION
This experiment (SC8) measured the flux and composition of ions in the mass range from 1 to 150 u and in the energy range from 0.1 to 20 keV. The sensor was an energetic ion mass spectrometer with three parallel analyzer units which measured ions in different energy ranges. Each unit consisted of a crossed electric and magnetic field velocity filter in series with an electrostatic analyzer with a channel electron multiplier sensor.

------- STP P78-2, KOONS--

INVESTIGATION NAME- CHARGING ELECTRICAL EFFECTS ANALYZER

NSSDC ID- 79-007A-02 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
TECHNOLOGY
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - H.C. KOONS AEROSPACE CORP

BRIEF DESCRIPTION
This experiment (part of SC1) measured electromagnetic interference in the range 100 to 3E7 Hz. Three separate instruments were used. The frequency range from 2 to 30 MHz was measured with a swept-frequency analyzer. The frequency band 1.3 to 300 kHz was monitored by fixed-frequency analyzers. The capability also existed to telemeter broadband signals from sensors in the frequency band 100 to 5000 Hz. The analyzer sampled signals from a variety of sensors, including solar array bus, power line bus, typical command line, external short dipole, and electric-field-detector boom.

------- STP P78-2, LEDLEY--

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 79-007A-08 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
PLANETARY MAGNETIC FIELD

PERSONNEL
PI - B.G. LEDLEY NASA-GSFC

BRIEF DESCRIPTION
This experiment (SC11) obtained triaxial measurements of the geomagnetic field. A boom-mounted (7-m boom) fluxgate magnetometer was used. Time resolution was 4 vectors per second. Field resolution was approximately 0.3 nT with a dynamic range of approximately plus and minus 450 nT per axis. Sensor response was from dc to 70 Hz.

------- STP P78-2, MIZERA--

INVESTIGATION NAME- SPACECRAFT SURFACE POTENTIAL MONITOR

NSSDC ID- 79-007A-01 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
TECHNOLOGY
SPACE PLASMAS

PERSONNEL
PI - P.F. MIZERA AEROSPACE CORP

BRIEF DESCRIPTION
This experiment (part of SC1) measured the surface potential of seven different types of materials relative to the common reference potential of a cylindrically shaped gold surface on the spacecraft. The sample was mounted on one surface of a dielectric slab, and a conducting plate was mounted on the other surface. The surface potential was measured from leakage currents and by a chopper electrometer (Monroe detectors). Some of the materials used were silicon, cloth fabric, solar cell cover glasses, gold (reference), silver-teflon, and kapton multilayer insulation. Five of the samples were placed on the sides of the spacecraft and rotated in and out of sunlight. Four samples were located at the end of the spacecraft in shadow.

------- STP P78-2, NANEVICZ--

INVESTIGATION NAME- TRANSIENT PULSE MONITOR

NSSDC ID- 79-007A-16 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J.E. NANEVICZ STANFORD RES INST

BRIEF DESCRIPTION
The Transient Pulse Monitor (TPM) was an engineering experiment which provided data on the electromagnetic pulse environment on the spacecraft. The experiment consisted of an electronic processor and four sensors which were built into the wiring harness. Two of the sensors were current probes which provided voltage signals to the electronic processor with sensitivities of 1 mV/mA. One of these probes measured current fluctuations in the solar array power line, and the other measured current fluctuations in the ground line of the main power system. The other two sensors were long wire antennas mounted outside the shields of the main cable bundles. The two antennas ran parallel to each other and differed only in the magnitude of their terminal impedances. The electronic processor had commendable sensitivities and continuously monitored electrical signals from each of the four sensors simultaneously. The processor provided the following information for each sensor once per second: total pulse count, positive voltage-time integral, negative voltage-time integral, positive peak voltage amplitude, and negative peak voltage amplitude. For more detail see Stevens, J. R., and A. L. Vampola, "Description of the space test program P78-2 spacecraft and payloads," Air Force Space and Missile Systems Organization (now Space Division) report SAMSO TR-78-24, October 1978 (TRF B34218).

------- STP P78-2, REAGAN--

INVESTIGATION NAME- HIGH-ENERGY PARTICLE DETECTOR

NSSDC ID- 79-007A-15 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - J.B. REAGAN LOCKHEED PALO ALTO

BRIEF DESCRIPTION
This experiment (SC3) measured the electron flux in the 0.3 to 2.1 MeV range, the proton flux in the 1 to 100 MeV range, and the flux of alpha particles in the range from 6 to 60 MeV. A high-energy particle spectrometer was used to determine flux and pitch-angle distributions.

****************************** STS 41-G ******************************

SPACECRAFT COMMON NAME- STS 41-G
ALTERNATE NAMES- OSTA-3/STS 41-G, 15353

NSSDC ID- 84-108A

LAUNCH DATE- 10/05/84 WEIGHT- KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 10/05/84
ORBIT PERIOD- 88.9 MIN INCLINATION- 57. DEG
PERIAPSIS- 216. KM ALT APOAPSIS- 229. KM ALT

PERSONNEL
MG - L. DEMAS NASA HEADQUARTERS
SC - M. SETTLE NASA HEADQUARTERS

BRIEF DESCRIPTION
The thirteenth flight of the Space Shuttle (STS 41-G) carried the OSTA-3 (Office of Space and Terrestrial Applications) payload designed for conducting experiments in earth remote sensing. This experiment payload consisted of (1) a Shuttle imaging radar (SIR-B) for studies of the earth's surface, (2) a large format camera (LFC) for cartographic mappings of the earth, (3) a measurement of air pollution from satellite (MAPS) experiment to determine the distribution of CO in the atmosphere, and (4) a feature identification and location experiment (FILE) for classification of surface materials. The SIR-B was an upgraded version of the SIR-A flown on the OSTA-1 payload during the STS-2 mission (NSSDC ID 81-111A-01). The MAPS and FILE sensors were the reflys of those same instruments on the OSTA-1 payload (NSSDC ID 81-111A-04 and 81-111A-03).

------- STS 41-G, ELACHI --

INVESTIGATION NAME- SHUTTLE IMAGING RADAR-B (SIR-B)

NSSDC ID- 84-108A-01 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL
PI - C. ELACHI NASA-JPL

BRIEF DESCRIPTION
The primary purpose of Shuttle Imaging Radar-B (SIR-B) experiment was to provide data for studies of geography, geology, hydrology, oceanography, vegetation, and ice applications. The SIR-B was a side-looking, synthetic aperture radar that illuminated the earth's surface with horizontally polarized (HH) microwave radiation transmitted at L-band frequency 1.28 GHz (wavelength 23 cm). The SIR-B antenna was mechanically tilted while the Shuttle's payload bay was facing the earth. This enabled researchers to obtain radar imagery of a specific area at up to six incidence angles ranging from 15 to 60 deg. Multiple-incidence-angle radar imagery was used to distinguish surface materials on the basis of their roughness characteristics. With a 12-MHz bandwidth and 20% degradation in the pulse, the ground range resolution was 17 m at a 60-deg incidence angle and was 58 m at 15 deg. The azimuth resolution was 25 m at all incidence angles. The swath width of the SIR-B imagery was 20-50 km. The SIR-B provided both digitally recorded and optically recorded data. The digital radar data were transmitted from the Shuttle through the Tracking And Data Relay Satellite System (TDRSS) to White Sands, New Mexico. White Sands relayed the SIR-B data via Domsat to GSFC. The digital tapes were then sent to JPL to be processed to imagery. The optical data were processed by an optical correlator at JPL.

------- STS 41-G, HOLLBERG --

INVESTIGATION NAME- LARGE FORMAT CAMERA (LFC)

NSSDC ID- 84-108A-02 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
GEODESY AND CARTOGRAPHY

PERSONNEL
PI - B. HOLLBERG NASA-JSC

BRIEF DESCRIPTION
The Large Format Camera (LFC) was a photographic camera with a 305-mm focal length, an f/6 aperture, and a film format of 23 by 46 cm. To minimize smearing effects, the camera's film platen moved horizontally along the Shuttle's line of flight when the shutter was open. A ground resolution of 10 m was achieved at altitudes of 200 to 250 km with standard photographic films. The LFC was able to obtain overlapping stereoscopic coverage along the Shuttle's flight path with base-to-height ratios of 0.3, 0.6, 0.9 and 1.2. Its imagery was applicable to cartographic mapping at a scale of 1:50,000.

------- STS 41-G, REICHLE, JR. --

INVESTIGATION NAME- MEASUREMENT OF AIR POLLUTION FROM SATELLITES (MAPS)

NSSDC ID- 84-108A-03 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
METEOROLOGY

ORIGINAL PAGE IS
OF POOR QUALITY

PERSONNEL
PI - H.G. REICHLE, JR. NASA-LARC

BRIEF DESCRIPTION
The primary purpose of this experiment was to measure the abundance of carbon monoxide in the troposphere. The MAPS experiment consisted of a two-channel gas filter radiometer that measured the intensity of upwelling thermal radiation at a wavelength of 4.67 micrometers. The instrument was designed to determine the concentration of CO in the earth's atmosphere at ambient pressures of 266 and 76 torr (corresponding roughly to altitudes of 7.5 and 11 km). An aerial camera, equipped with a light sensor, photographed the ground track during sunlit portions of the orbit.

------- STS 41-G, SIVERTSON, JR. --

INVESTIGATION NAME- FEATURE IDENTIFICATION AND LOCATION EXPERIMENT (FILE)

NSSDC ID- 84-108A-04 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL
PI - W.E. SIVERTSON, JR. NASA-LARC
OI - R.G. WILSON NASA-LARC

BRIEF DESCRIPTION
The objective of this experiment was to develop the means to automatically classify surface materials into one of four categories: water, vegetation, bare ground, or clouds and snow. The FILE compared ratios of reflected solar radiation in two wavelength bands to make real-time classification decisions about the four primary features mentioned above. The FILE system had two imaging cameras; each contained a two-dimensional array of charge-coupled detectors. One camera was designed to measure surface reflectivity at a wavelength of 0.65 micrometer, the other at 0.85 micrometer. A sunrise sensor activated the experiment under appropriate solar illumination conditions. The output of the two imaging cameras was sent to a decision-making electronics unit, where the ratio of the two camera measurements for each picture element was determined. FILE contained scene class counters to determine when the instrument had recorded an adequate number of scenes of each type and to suppress further data acquisition from such scenes. Similar sensors may be placed on future satellites to control the operation of other earth-imaging instruments and to avoid the collection of unwanted or unusable data.

**************************** STS 9/SPACELAB 1 ******************

SPACECRAFT COMMON NAME- STS 9/SPACELAB 1
ALTERNATE NAMES- SPACELAB 1/STS 9, SPACE TRANSPORT SYS-9
14523, SPACELAB 1

NSSDC ID- 83-116A

LAUNCH DATE- 11/28/83 WEIGHT- 14500. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 11/29/83
ORBIT PERIOD- 89.5 MIN INCLINATION- 57. DEG
PERIAPSIS- 242. KM ALT APOAPSIS- 254. KM ALT

PERSONNEL
MM - J.A. DOWNEY, 3RD NASA-MSFC
MS - C.R. CHAPPELL NASA-MSFC
MG - M.J. SMITH NASA HEADQUARTERS
SC - M. WISKERCHEN NASA HEADQUARTERS
PM - H.G. CRAFT, JR. NASA-MSFC

BRIEF DESCRIPTION
The first Spacelab mission was a joint NASA and European Space Agency (ESA) mission. Spacelab 1 consisted of a pressurized compartment (module) for housing equipment and flight personnel and a space-exposed platform to accommodate instruments. The compartment and platform were flown into space and returned inside the payload compartment of the Space Shuttle. The mission lasted 10 days, and while in space, the Shuttle payload compartment doors were opened to allow viewing of the earth, sun, and deep space. Spacelab 1 was a multidiscipline mission comprising five broad areas of investigation: Atmospheric Physics and Earth Observations, Space Plasma Physics, Astronomy and Solar Physics, Material Sciences and Technology, and Life Sciences. The Atmospheric Physics investigations conducted studies of the earth's environment through surveys of temperature, composition, and motion of the atmosphere. The Earth Observations investigations used and evaluated the capability of advanced measuring systems for making topographic and thematic maps from high-resolution photographs and from remote-sensing data. Investigations in the Space Plasma Physics group studied the charged particle or plasma environment of the earth. The Astronomy investigations studied astronomical sources of

radiation in the ultraviolet and X-ray wavelengths. The Solar Physics investigations measured the total energy output of the sun using three different methods with the instruments cross calibrated so that meaningful comparisons could be made. The Material Sciences and Technology investigations took advantage of the microgravity conditions to perform studies in such areas as crystal growth, metallurgy, tribology, fluid physics, and ceramics technology. The Life Sciences investigations were concerned with the effects of the space environment (zero gravity and high-energy radiation) on human physiology and on the growth, development, and organization of biological systems. The mission was considered very successful.

------- STS 9/SPACELAB 1, ACKERMAN------------------------------

INVESTIGATION NAME- GRILLE SPECTROMETER

NSSDC ID- 83-116A-18 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL

PI - M.	ACKERMAN	IASB
OI - C.	LIPPENS	IASB
OI - A.	GIRARD	ONERA
OI - M.	BESSON	ONERA
OI - J.	LAURENT	ONERA
OI - M.P.	LEMAITRE	ONERA
OI - J.	VERCHEVAL	IASB
OI - C.	MULLER	IASB

BRIEF DESCRIPTION
The experiment objective was to determine the vertical distribution profiles of trace constituents in the stratosphere, mesosphere, and thermosphere in order to study the chemical and dynamical atmospheric processes. The equipment contained an infrared spectrometer with a telescope and a cooled infrared detector. The spectrometer operated in the wavelength range from 2.5 to 13 micrometers. As a result of the compromise that had to be made in launch time of day and year, only 16% of the planned objectives could be achieved and the experiment was identified prior to the mission for reflight. In spite of the unfavorable flight conditions the experiment led to the first measurement of water, carbon dioxide, and methane in the mesosphere.

------- STS 9/SPACELAB 1, ANDRESEN------------------------------

INVESTIGATION NAME- SPECTROSCOPY IN X-RAY ASTRONOMY

NSSDC ID- 83-116A-28 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

PI - R.D.	ANDRESEN	ESA-ESTEC
OI - S.J.	KELLOCK	MULLARD SPACE SCI LAB
OI - L.	SCARSI	U OF PALERMO
OI - G.	BOELLA	U OF MILAN

BRIEF DESCRIPTION
The experiment objective was the study of detailed features in cosmic X-ray sources and their associated temporal variations over a wide energy range. The equipment was a gas scintillation proportional counter having a 175-micrometer beryllium window, a xenon chamber, a photomultiplier detector, and a pulse-height analyzer. A more detailed description of this experiment may be found in R. D. Andersen et al., Adv. Space Res., v. 2, n. 4, p. 281, 1983. One hundred percent of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, BEAUJEAN------------------------------

INVESTIGATION NAME- ISOTOPE STACK

NSSDC ID- 83-116A-29 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - R.	BEAUJEAN	U OF KIEL
OI - W.	ENGE	U OF KIEL
OI - G.	SIEGMON	U OF KIEL

BRIEF DESCRIPTION
The experiment objective was to use a stack of plastic sheets to measure heavy cosmic-ray nuclei (nuclear charge equal to or greater than 3, energies in the range 20 MeV to 1 GeV per atomic mass unit) and to determine the source, acceleration, propagation, and age of cosmic rays. The equipment consisted of a stack of layers of plastic visual track detectors housed in a sealed aluminum container. One hundred percent of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, BEGHIN------------------------------

INVESTIGATION NAME- PHENOMENA INDUCED BY CHARGED PARTICLE
BEAMS

NSSDC ID- 83-116A-25 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL

PI - C.	BEGHIN	CNRS, CTR FOR SPECTROM
OI - B.	NARHEIM	NDRE
OI - T.	MOE	NDRE
OI - D.	HENRY	CNRS
OI - J.Y.	DELAHAYE	CNRS-LGE
OI - J.J.	BERTHELIER	CRPE, CNRS-CNET
OI - J.	LAVERGNAT	CNRS-LGE
OI - B.N.	MAEHLUM	NDRE
OI - J.	TROIM	NDRE
OI - H.	ARENDS	ESA-ESTEC
OI - D.	KLINGE	ESA-ESTEC
OI - T.R.	SANDERSON	ESA-ESTEC

BRIEF DESCRIPTION
The experiment objectives were to use electron- and ion-beam guns (up to 10 keV), an associated wave receiver (up to 100 MHz), an electron-temperature probe, and three particle detectors (1) to study ionospheric neutralization processes by studying the stability of the electronic potential of the gun with respect to the plasma, (2) to study plasma instabilities by measuring electric (up to 100 MHz) and magnetic (200 Hz to 20 MHz) wave components, (3) to use the Shuttle motion to perform ion-bounce experiments, and (4) to monitor the secondary electron flux. The equipment consisted of an active package containing an electron gun, an ion gun, and a particle detector; and a passive package containing an electric antenna, a magnetic antenna, and two particle detectors. Loss of some data was experienced due to a gas bottle failure. As a consequence only 60% of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, BENTON------------------------------

INVESTIGATION NAME- RADIATION ENVIRONMENT MAPPING

NSSDC ID- 83-116A-11 INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE BIOLOGY

PERSONNEL

PI - E.V.	BENTON	U OF CALIF, SAN FRANC.
OI - D.D.	PETERSON	U OF CALIF, SAN FRANC.
OI - R.M.	CASSOU	U OF CALIF, SAN FRANC.
OI - A.L.	FRANK	U OF CALIF, SAN FRANC.

BRIEF DESCRIPTION
The objectives of this experiment were to provide baseline data for evaluation of radiation risk to man from high charge and energy (HZE) particles on this and future Spacelab missions, and to continue a program of documentation of HZE particle radiation inside manned spacecraft which has included Apollo, Skylab, and ASTP missions. The equipment consisted of 12 small, lightweight, passive dosimeter packets and three thick multilayered stacks of plastic detector films attached at sites corresponding to a wide range of spacecraft shielding. Materials used in the dosimeter included plastic nuclear track detectors, AgCl crystal detectors, and thermoluminescent detector chips. The thick plastic stacks consisted of 200 Lexan polycarbonate plastic films. One hundred percent of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, BERTAUX------------------------------

INVESTIGATION NAME- INVESTIGATION ON ATMOSPHERIC H AND D
THROUGH THE MEASUREMENT OF LYMAN-ALPHA

NSSDC ID- 83-116A-22 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
ATMOSPHERIC PHYSICS

PERSONNEL

PI - J.L.	BERTAUX	CNRS-SA
OI - G.	KOCKARTS	IASB
OI - F.	GOUTAIL	CNRS-SA

BRIEF DESCRIPTION
The experiment objective was to study various sources of Lyman-alpha emission in the atmosphere, in the interplanetary medium, and possibly in the galactic medium. The equipment consisted of a spectrophotometer with an atomic hydrogen absorption cell and an atomic deuterium absorption cell, and a solar-blind photomultiplier for the detector. A major accomplishment of this experiment was the quantification of the amount of deuterium in the thermosphere. About 80% of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, BOWYER------------------------------

INVESTIGATION NAME- FAR UV ASTRONOMY USING THE FAUST TELESCOPE

NSSDC ID- 83-116A-07

INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - C.S.	BOWYER	U OF CALIF, BERKELEY
OI - G.C.	COURTES	CNRS-LAS
OI - J.M.	DEHARVENG	CNRS-LAS
OI - R.	MALINA	U OF CALIF, BERKELEY
OI - J.C.	BERGES	CNRS-LAS

BRIEF DESCRIPTION

The experiment objective was to search for UV stars and other astronomical UV sources in the 110- to 200-nm band. The equipment consisted of a far ultraviolet space telescope (FAUST) and an electronic interface module. The instrument was an f/1.12 Wynne camera with an effective collecting area of 150 sq cm and a field of view of 7.5 deg. The imaging capability was better than 2 arc-min in the entire field of view. The detector system used a microchannel plate image intensifier in conjunction with a 60-exposure, 35-mm film pack of Kodak IIAO. Approximately 95% of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, BROWN------------------------------

INVESTIGATION NAME- NUTATION OF HELIANTHUS ANNUUS

NSSDC ID- 83-116A-12

INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - A.H.	BROWN	U OF PENNSYLVANIA
OI - A.O.	DAHL	U OF PENNSYLVANIA
OI - D.K.	CHAPMAN	U OF PENNSYLVANIA

BRIEF DESCRIPTION

The experiment objective was to determine whether or not nutation (spiral motion of growing plants) takes place in the absence of a gravitational force. The test plants were dwarf sunflower seedlings (Helianthus annuus). The equipment consisted of a dark box, within which four test plants illuminated by infrared light could be located in the field of view of a video camera; rotor compartments; battery pack; video tape data recorder; control electronics; and a carry-on container of 28 plant modules, each containing one plant. Plants at various stages of growth were kept in a rotor compartment under a 1-g acceleration until it was their turn to be tested in front of the camera. Approximately 60% of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, BUCKER------------------------------

INVESTIGATION NAME- ADVANCED BIOSTACK EXPERIMENT

NSSDC ID- 83-116A-32

INVESTIGATIVE PROGRAM
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - H.	BUCKER	DFVLR

BRIEF DESCRIPTION

The experiment objectives were to determine the biological importance of nuclear disintegration stars, to assess quantitatively the interference of high-atomic-number, high-energy (HZE) particles with other biological studies in space, to determine the distribution of HZE particles at different locations in the module and on the pallet, and to establish radiation protection guidelines for humans and biological experiments in future space flights. The experimental packages consisted of layers of different biological objects sandwiched between different types of HZE detectors. This arrangement permitted correlations between HZE particle trajectories and biological injury. One hundred percent of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, COGOLI------------------------------

INVESTIGATION NAME- LYMPHOCYTE PROLIFERATION IN WEIGHTLESSNESS

NSSDC ID- 83-116A-36

INVESTIGATIVE PROGRAM
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - A.	COGOLI	FEDERAL INST OF TECH
OI - M.	VALLUCHI	FEDERAL INST OF TECH
OI - A.	TSCHOPP	FEDERAL INST OF TECH

BRIEF DESCRIPTION

The objective of this experiment was to study the effect of weightlessness on white cell proliferation and to detect possible alteration to the cells responsible for the immune response. The instrumentation included flasks containing human lymphocytes to which a mitogen was added in flight to induce cell division. Stimulated and control flasks were kept at 37 deg C by an incubator for 70 h, after which they were stored in a freezer for postflight analysis. One hundred percent of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, COURTES------------------------------

INVESTIGATION NAME- VERY WIDE FIELD GALACTIC CAMERA

NSSDC ID- 83-116A-27

INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
ZODIACAL LIGHT

PERSONNEL

PI - G.C.	COURTES	CNRS-LAS
OI - M.	VITON	CNRS-LAS
OI - J.P.	SIVAN	CNRS-LAS
OI - R.	DECHER	NASA-MSFC
OI - G.A.	GARY	NASA-MSFC

BRIEF DESCRIPTION

The experiment objective was to make a very general UV survey of a large part of the celestial sphere. A camera with a very wide field of view was used in two modes. In the photometric mode, observations were made at 155, 190, and 250 nm and the field of view was 54 deg. In the spectrometric mode, a narrow slit 10 deg by 10 arc-min was used and measurements were obtained in the 130- to 270-nm range. One hundred percent of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, CROMMELYNCK------------------------------

INVESTIGATION NAME- ABSOLUTE MEASUREMENT OF THE SOLAR CONSTANT

NSSDC ID- 83-116A-26

INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - D.	CROMMELYNCK	ROYAL METEOR.INST BELG
OI - V.	DOMINGO	ESA-ESTEC

BRIEF DESCRIPTION

The experiment objectives were (1) to measure the absolute value of the solar constant to 0.1% accuracy using a self-calibrating radiometer, and (2) to measure any long-term variations in the solar constant, using this instrument on several Spacelab flights. The equipment consisted of an absolute radiometer with a builtin stability check. This radiometer had two channels which enabled any degradation of the black surfaces to be detected and compensated. The radiation measurements were made by using a heat balance system driven automatically by a feedback system. Approximately 90% of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, DIETERLE------------------------------

INVESTIGATION NAME- MICROWAVE REMOTE SENSING EXPERIMENT

NSSDC ID- 83-116A-39

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
OCEANOGRAPHY
EARTH RESOURCES SURVEY

PERSONNEL

PI - G.	DIETERLE	ESA-TOULOUSE
PI - G.P.	DE LOOR	TNO PHYSICS LAB

BRIEF DESCRIPTION

The objectives of the microwave remote sensing experiment were to develop all-weather remote sensing methods, study sensor-object interaction by measurement of ocean surface wave spectra with a two-frequency scatterometer, and verify synthetic aperture radar behavior. The microwave remote sensing experiment instrumentation was a radar facility. In the active modes, the instrument transmitted microwave energy in X-band (9.65 GHz) to earth targets. A sensitive low-noise receiver detected the backscattered radar signals. The instrument operated in three modes: (1) a main mode as a two-frequency scatterometer (2FS), (2) a high-resolution mode as a synthetic aperture radar (SAR), and (3) a passive mode as a passive microwave radiometer. In the 2FS mode, the instrument measured the ocean surface wave spectra at wavelengths within a range of 5 to 500 m by using the complex

backscattering of the ocean surface at two adjacent microwave frequencies. In the SAR mode, areas of the earth's surface were imaged. The backscattered data were coherently recorded and off-line processing provided imagery with a ground resolution of 25 m by 25 m. The radiometer mode, which measured naturally emitted microwave radiation from the earth to provide ocean surface temperatures, was used in time multiplex with other modes. Due to equipment malfunction, only 20% of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, GREEN--------------------------------

INVESTIGATION NAME- ELECTRO-PHYSIOLOGICAL TAPE RECORDER

NSSDC ID- 83-116A-35 INVESTIGATIVE PROGRAM
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - H.L. GREEN CLINICAL RES CENTER
OI - F.D. STOTT CLINICAL RES CENTER
OI - H.S. WOLFF CLINICAL RES CENTER
OI - O. QUADENS U OF ANTWERP

BRIEF DESCRIPTION
The experiment objective was to study acclimatization of astronauts to zero gravity by means of electrocardiograms (ECG), electroencephalograms (EEG), and electro-oculograms (EOG) obtained before launch, throughout the mission, and after the flight. The equipment was a standard Oxford Instruments Medilog four-channel tape recorder with electrodes, spare batteries, and tape cassettes. The recorder was attached to the belt of a crew member. One hundred percent of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, HERSE--------------------------------

INVESTIGATION NAME- WAVES IN THE OH EMISSIVE LAYER

NSSDC ID- 83-116A-19 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
ATMOSPHERIC PHYSICS

PERSONNEL
PI - M. HERSE CNRS-SA
OI - G. MOREELS CNRS-SA
OI - S. PRAKASH PHYSICAL RESEARCH LAB

BRIEF DESCRIPTION
The experiment objectives were to study the large-scale structure of the atmospheric OH emission, and to investigate possible relations between the OH emission structure and meteorological phenomena. The equipment contained an image intensifier with a camera, filter, and 16-mm movie camera. The spectral part of the airglow was delimited on the short wavelength side by a Schott RG9 filter (50% cutoff at 730 nm) and on the IR side by the sensitivity of the photocathode (50% cutoff at 830 nm). One hundred percent of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, HORNECK------------------------------

INVESTIGATION NAME- MICRO-ORGANISMS AND BIOMOLECULES IN THE SPACE ENVIRONMENT

NSSDC ID- 83-116A-34 INVESTIGATIVE PROGRAM
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - G. HORNECK DFVLR
OI - C. THOMAS-GARFIAS DFVLR
OI - G. REITZ DFVLR

BRIEF DESCRIPTION
The experiment objectives were (1) to measure quantitatively the effects of space parameters (vacuum, solar UV-radiation) on microbial systems and biomolecules, using Bacillus Subtilis spores as the test specimens; (2) to evaluate the consequences of genetic and response alterations; and (3) to compare the results with simulation experiments performed on the ground. The equipment was a box accommodating 350 biological samples. The samples were exposed to selected combinations of space vacuum and solar radiation of various wavelengths and intensities. One hundred percent of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, HUTH---------------------------------

INVESTIGATION NAME- MATERIALS SCIENCE

NSSDC ID- 83-116A-42 INVESTIGATIVE PROGRAM
CODE EN/CO-OP

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - U. HUTH ESA
OI - Y. MALMEJAC CEA-DMECN
OI - L.G. NAPOLITANO U OF NAPLES

BRIEF DESCRIPTION
The materials science facility included 36 different experiments. Six of these experiments were individual, black-box type experiments which required only provision of power, data recording, and heat rejection. The 32 other experiments were performed with the help of multi-user facilities. The isothermal heating facility was a multi-user facility for different types of experiments, including solidification studies, diffusion fundamentals, casting of metals and composites, and preparation of new and/or improved glasses and ceramics. The gradient heating facility for low temperatures was a multipurpose facility for different types of experiments such as crystal growth and unidirectional solidification of eutectics. Vacuum and noble gas supply provisions were part of the facility. The mirror heating facility was an experimental facility which was particularly suitable for investigating crystal growth using the melt zone or traveling solvent methods. The fluid physics module consisted mainly of a structure fitted with two disks which could be rotated separately, at the same or different speeds, and in either direction. Different fluids could be injected and recovered from this structure. Thirty of the 36 planned experiments were completed successfully. Of the remaining six experiments, three could not be performed, and three achieved between 25% and 50% of their objectives because the isothermal heating facility was disabled during part of the flight. One significant accomplishment of the materials science experiments was the growing in space of the first large crystal of silicon.

------- STS 9/SPACELAB 1, KIRSCH-------------------------------

INVESTIGATION NAME- MEASUREMENT OF (CENTRAL) VENOUS PRESSURE BY PUNCTURING AN ARM VEIN

NSSDC ID- 83-116A-31 INVESTIGATIVE PROGRAM
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - K. KIRSCH U OF BERLIN
OI - R. KOCH U OF BERLIN
OI - F. ROCKER U OF BERLIN

BRIEF DESCRIPTION
The experiment objective was to investigate the severe engorgement of the cephalad circulation (characterized by distended neck veins, puffy face, and nasal congestion) that is experienced by astronauts upon entry into the weightlessness condition. For this experiment the central venous pressure was measured by puncturing an arm vein with a needle-manometer (strain gauge). One hundred percent of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, KIRSCH-------------------------------

INVESTIGATION NAME- COLLECTION BLOOD SAMPLES FOR DETERMINING A.D.H., ALDOSTERONE, AND OTHER HORMONES

NSSDC ID- 83-116A-37 INVESTIGATIVE PROGRAM
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - K. KIRSCH U OF BERLIN
OI - R. KOCH U OF BERLIN
OI - H. STOBOY U OF BERLIN

BRIEF DESCRIPTION
The experiment objective was to investigate gross deviations from normal fluid and mineral metabolism observed in weightlessness. This experiment measured the blood serum hormones that are responsible for the control of water and mineral balance. Blood samples were collected during flight with the same needles that were used in Experiment 31 (Kirsch), and analyzed subsequent to flight. One hundred percent of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, LEACH--------------------------------

INVESTIGATION NAME- INFLUENCE OF SPACEFLIGHT ON ERYTHROKINETICS IN MAN

NSSDC ID- 83-116A-14 INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - C.S.	LEACH	NASA-JSC
OI - W.H.	CROSBY	SCRIPPS C+R FOUNDATION
OI - M.	TAVASSOLI	SCRIPPS C+R FOUNDATION
OI - P.C.	JOHNSON	BAYLOR U
OI - J.P.	CHEN	U OF TENNESSEE
OI - C.D.R.DUNN		BAYLOR U
OI - R.D.	LANGE	U OF TENNESSEE
OI - E.C.	LARKIN	V.A. HOSP, MARTINEZ

BRIEF DESCRIPTION

The experiment objective was to obtain new and specific information pertaining to the mechanism and site of action relative to the red blood cell mass and plasma volume reduction observed during space flight. The equipment consisted of an inflight blood collection system. One hundred percent of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, MENDE-------------------------------

INVESTIGATION NAME- ATMOSPHERIC EMISSION PHOTOMETRIC IMAGING

NSSDC ID- 83-116A-03 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL

PI - S.B.	MENDE	LOCKHEED PALO ALTO
OI - R.H.	EATHER	BOSTON COLLEGE
OI - R.J.	NAUMANN	NASA-MSFC
OI - D.L.	REASONER	NASA-MSFC
OI - G.R.	SWENSON	LOCKHEED PALO ALTO
OI - B.J.	DUNCAN	NASA-MSFC
OI - K.S.	CLIFTON	NASA-MSFC

BRIEF DESCRIPTION

The experiment objectives were (1) to investigate upper atmospheric transport processes through the measurement of resonant scattered emissions from positive Mg ions, (2) to measure excitation cross sections of upper atmospheric constituents using injected particle beams and detection of the resulting emissions, (3) to investigate atmospheric composition and energy budget through observations of natural aurora, (4) to observe large- and small-scale auroral morphology and compare ultraviolet and visible auroral features, (5) to support the electron accelerator in conducting measurements of magnetospheric electric fields, and (6) to measure small particulate contamination around the Shuttle/Spacelab. The equipment consisted of (1) a dual-channel video system with associated optics and data handling electronics mounted on a stabilized platform for pointing and control, (2) SEC vidicon for high-sensitivity, high-resolution operation, (3) a low-resolution microchannel plate array operating in a photon counting mode, and (4) command and data management systems and onboard recorders utilized for data display and recording. The magnesium positive ion resonance line was imaged at 279.5 and 280.2 nm. For the study of the 2p state of singly ionized atomic oxygen, simultaneous sensing at 731.9 and 247.0 nm was obtained. Approximately 65% of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, OBAYASHI----------------------------

INVESTIGATION NAME- SPACE EXPERIMENTS WITH PARTICLE ACCELERATORS (SEPAC)

NSSDC ID- 83-116A-02 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES
AERONOMY

PERSONNEL

PI - T.	OBAYASHI	ISAS, U OF TOKYO
OI - W.W.L.TAYLOR		TRW SYSTEMS GROUP
OI - J.L.	BURCH	SOUTHWEST RES INST
OI - C.R.	CHAPPELL	NASA-MSFC
OI - W.T.	ROBERTS	NASA-MSFC
OI - P.M.	BANKS	STANFORD U

BRIEF DESCRIPTION

The experiment objectives were to carry out active and interactive experiments in the earth's ionosphere to study (1) auroral production in the upper atmosphere, (2) ionospheric parameters such as anomalous resistivity, plasma coupling processes, electric and magnetic field morphology, vehicle charge neutralization, Shuttle/Spacelab induced environments, electron beam/neutral-plume interaction, the coupling between the earth's atmosphere and magnetosphere, and (3) the effects of particle interactions on atmospheric dynamics. The equipment consisted of an electron beam accelerator, magneto plasma dynamic (MPD) arcjet, battery/capacitor bank to provide high discharge current, monitor and diagnostic devices, and control, display, and data management systems. The electron beam accelerator, MPD arcjet, and neutral gas ejector were contained in the accelerator subsystem. The electron beam accelerator was capable of operating at voltages from 1 to 7.5 kV at a maximum of 1.5 A and with a variable pulse width of from 10 ms to 1 s. The MPD arcjet used argon gas and had an energy input of 2 kJ per pulse. The third accelerator component was a neutral gas plume generator which used nitrogen as the gas. Approximately 80% of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, PAN----------------------------------

INVESTIGATION NAME- BEARING LUBRICANT WETTING, SPREADING AND OPERATING CHARACTERISTICS IN ZERO-G

NSSDC ID- 83-116A-09 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

PI - C.H.T.PAN		COLUMBIA U
PI - A.F.	WHITAKER	NASA-MSFC
PI - R.L.	GAUSE	NASA-MSFC

BRIEF DESCRIPTION

The experiment objectives were (1) to determine the extent to which selected commercial lubricant wettability is affected by a zero-gravity environment, (2) to determine how bearing torque, bearing lubricant feeding, and bearing operating films are altered by operations in zero gravity, (3) to compare results with laboratory research of commercial applications, and (4) to provide data for applications in space hardware. The equipment consisted of plates for lubricant wetting and spreading tests, various journal bearings, and a flight camera to record lubricant responses. Two types of experiments were planned: wetting and spreading on stationary surfaces, and two-phase boundary in a journal-bearing configuration. In each case, the fluid-surface combination was the primary control parameter. One hundred percent of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, RESCHKE-----------------------------

INVESTIGATION NAME- VESTIBULO-SPINAL REFLEX MECHANISMS

NSSDC ID- 83-116A-16 INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - M.F.	RESCHKE	NASA-JSC
OI - J.L.	HOMICK	NASA-JSC
OI - D.J.	ANDERSON	U OF MICHIGAN

BRIEF DESCRIPTION

This investigation had three basic objectives: (1) to investigate vestibulo-spinal reflexes associated with an applied acceleration and concurrent activation of nerve tissue by a mild electrical shock; (2) to observe any incidental occurrence of motion sickness; and (3) to investigate the post-flight return to normal vestibulo-spinal reflexes. The instrumentation included low-power electronic equipment to elicit and record the reflexes and the "hop and drop" equipment of Experiment 13 (Young) to provide the linear acceleration. Approximately 85% of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, REYNOLDS----------------------------

INVESTIGATION NAME- METRIC CAMERA EXPERIMENT

NSSDC ID- 83-116A-38 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL

PI - M.	REYNOLDS	ESA-TOULOUSE
PI - G.	KONECNY	TECH U OF HANNOVER

BRIEF DESCRIPTION

The purpose of the metric camera experiment was to test the mapping capability of high-resolution space photography. The experiment used a Zeiss RMK A30/23 aerial survey camera and a Skylab optical window, having the following characteristics: f = 305 mm; f-stops available--f/5.6, f/8, f/11; shutter speeds--1/100, 1/250, 1/500, and 1/1000 s; negative size--23 x 23 cm (length for 550 photos per magazine); angle of field--56 deg; and ground resolution--20 m. Black-and-white, color, and color IR films could be used. To get 80% longitudinal overlap of subsequent photographs at a Spacelab velocity of 7.7 km/s, there was a time interval of about 5 s between two successive exposures. Strips 1800 to 2300 km in length could be covered on the ground in each sequence. Approximately 80% of the planned objectives were accomplished.

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------- STS 9/SPACELAB 1, ROSS---------------------------------

INVESTIGATION NAME- MASS DISCRIMINATION DURING WEIGHTLESSNESS

NSSDC ID- 83-116A-30 INVESTIGATIVE PROGRAM CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S) SPACE BIOLOGY

PERSONNEL
PI - H. ROSS U OF STIRLING
OI - H.S. WOLFF CLINICAL RES CENTER

BRIEF DESCRIPTION
The experiment objective was to compare mass discrimination when both the observer and the test objects are weightless, with weight discrimination under normal gravity. The equipment was a box containing 24 balls, each 3 cm in diameter. The mass of the balls varied from 50 to 64 g. The crew member was directed to perform comparisons in which he had to decide which of two specified balls was the heavier. This test was performed for 72 assigned pairs, and the result was recorded for each comparison. Approximately 90% of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, SCANO---------------------------------

INVESTIGATION NAME- BALLISTOCARDIOGRAPHIC RESEARCH IN WEIGHTLESSNESS

NSSDC ID- 83-116A-33 INVESTIGATIVE PROGRAM CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S) SPACE BIOLOGY

PERSONNEL
PI - A. SCANO U OF ROME

BRIEF DESCRIPTION
The experiment objectives were to record a three-dimensional ballistocardiogram (BCG) in a resting weightless human subject and compare it with similar tracings recorded on the same subject in ground conditions, possibly to find BCG modifications in relation to cardiovascular adaptation to weightlessness, and to record other body accelerations under various physiological conditions. The equipment consisted of three mini-accelerometers and a four-track miniature recorder. One hundred percent of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, SCHMIDT-------------------------------

INVESTIGATION NAME- DC AND LOW FREQUENCY VECTOR MAGNETOMETER

NSSDC ID- 83-116A-23 INVESTIGATIVE PROGRAM CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S) MAGNETOSPHERIC PHYSICS PARTICLES AND FIELDS

PERSONNEL
PI - R. SCHMIDT AUSTRIAN ACAD OF SCI

BRIEF DESCRIPTION
The experiment objectives were to use a three-axis fluxgate magnetometer to study (1) magnetic fields of the ionospheric polar electrojet and its return current, equatorial electrojet, and the solar quiet current, (2) the vector magnetic field as a plasma parameter, and (3) the Spacelab magnetic field background. The equipment consisted of two separate three-axis fluxgate sensors. Approximately 90% of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, SULZMAN-------------------------------

INVESTIGATION NAME- CHARACTERIZATION OF PERSISTING CIRCADIAN RHYTHMS

NSSDC ID- 83-116A-15 INVESTIGATIVE PROGRAM CODE EB

INVESTIGATION DISCIPLINE(S) SPACE BIOLOGY

PERSONNEL
PI - F.M. SULZMAN STATE U OF NEW YORK
OI - M.C. MOORE-EDE HARVARD MEDICAL SCHOOL
OI - C.A. FULLER U OF CALIF, RIVERSIDE

BRIEF DESCRIPTION
The experiment objective was to test if circadian rhythms persist outside the earth's environment, and to determine if the circadian timing system is exogenous or endogenous. Common fungus Neurospora Crassa (which produces patches of extensive growth once each day) was used as the test subject. The equipment consisted of a light-tight box containing the growth tubes. One hundred percent of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, THUILLIER-----------------------------

INVESTIGATION NAME- MEASUREMENT OF THE SOLAR SPECTRUM FROM 170 TO 3200 NANOMETERS

NSSDC ID- 83-116A-21 INVESTIGATIVE PROGRAM CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S) SOLAR PHYSICS

PERSONNEL
PI - G. THUILLIER CNRS-SA
OI - J.E. BLAMONT CNRS-SA
OI - P.C. SIMON IASB
OI - R. PASTIELS IASB
OI - D. LABS LANDESSTERNWARTE
OI - H. NECKEL HAMBURGER STERNWARTE

BRIEF DESCRIPTION
The experiment objective was to measure the solar spectral irradiance between 170 and 3200 nm with an accuracy of 0.1% in order to determine the solar constant, variations in the solar constant with solar cycle using Spacelab/STS flights over a 10-year period, and variations of irradiance within each spectral region. The equipment consisted of three grating spectrometers covering UV (170 to 370 nm), visible (350 to 900 nm), and IR (800 to 3200 nm). One hundred percent of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, TORR----------------------------------

INVESTIGATION NAME- AN IMAGING SPECTROMETRIC OBSERVATORY

NSSDC ID- 83-116A-01 INVESTIGATIVE PROGRAM CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S) ATMOSPHERIC PHYSICS

PERSONNEL
PI - M.R. TORR UTAH STATE U
OI - S.K. ATREYA U OF MICHIGAN
OI - G.R. CARIGNAN U OF MICHIGAN
OI - J.C.G.WALKER ARECIBO OBSERVATORY
OI - D.G. TORR UTAH STATE U
OI - T.M. DONAHUE U OF MICHIGAN

BRIEF DESCRIPTION
The experiment objectives were (1) to obtain the first daytime measurements of the airglow spectrum from the extreme ultraviolet to the infrared (20 to 1200 nm), (2) to monitor the Shuttle-induced contamination; and (3) to serve as a precursor for future Shuttle flights. It was planned to measure emissions from a large range of minor constituents, metastable and excited species of both atomic and molecular ions and neutrals in the atmosphere from the stratosphere to the upper thermosphere. The flight instrument was designed for high-speed operation as an imaging device, and was composed of five modules containing identical spectrometers, each of which was restricted to a given spectral range within the 20- to 1200-nm region. Each module was an imaging scanning spectrometer, and the modules had coincident 0.5- x 0.007-deg fields of view. Imaging capability was obtained along the length of the observational field by use of an area array detector comprising 190 x 244 elements. Thus, a single measurement produced adjacent spectra in a given module obtained from adjacent observational fields. Wavelength resolution varied between 0.2 and 0.6 nm over the spectral range. A scan mirror was used, and a single exposure at one scan position covered a 250-nm region. The telescope was baffled, and it had several operating modes. Approximately 80% of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, VON BAUMGARTEN------------------------

INVESTIGATION NAME- EFFECTS OF RECTILINEAR ACCELERATION, OPTOKINETIC AND CALORIC STIMULI IN SPACE

NSSDC ID- 83-116A-41 INVESTIGATIVE PROGRAM CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S) SPACE BIOLOGY

PERSONNEL
PI - R. VON BAUMGARTEN JOHANNES GUTENBERG U
OI - J. DICHGANS U OF TUBINGEN
OI - T. BRANDT KRUPP KRANKEN-ANGSTALN
OI - H. SCHERER U OF MUNICH
OI - A. BERTHOZ CNRS-LPT

BRIEF DESCRIPTION
The experiment objective was to study the visuovestibular coordination and the integration of multisensory stimuli within the orientation centers of the brain by exposing the subject to short periods of linear acceleration in conjunction with optokinetic stimulation and caloric stimulation. A linear acceleration sled-like device called the "body restraint system" was used to hold and protect the test subject during exposure to motion stimuli. The subject's head was held by a helmet-like device that contained an optokinetic stimulation display, a caloric stimulation system, an optical target setting system, an eye-movement recorder, and various other

recording systems. Approximately 75% of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, VOSS, JR.-------------------------

INVESTIGATION NAME- EFFECTS OF PROLONGED WEIGHTLESSNESS ON THE HUMORAL IMMUNE RESPONSE OF HUMANS

NSSDC ID- 83-116A-17

INVESTIGATIVE PROGRAM
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - E.W.	VOSS, JR.	U OF ILLINOIS

BRIEF DESCRIPTION

The experiment objectives were (1) to obtain an evaluation of prolonged weightlessness as a stress factor on the humoral immune response of humans, and (2) to establish the capability of humans to respond immunologically to potential foreign pathogens during future sustained space flight. The equipment included a container for storing blood samples, sterile syringes, needles, and test tubes. One hundred percent of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, WILHELM-------------------------

INVESTIGATION NAME- STUDY OF LOW-ENERGY ELECTRON FLUX AND ITS REACTION TO ACTIVE EXPERIMENTATION

NSSDC ID- 83-116A-24

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - K.	WILHELM	MPI-AERONOMY
OI - W.	STUDEMANN	MPI-AERONOMY
OI - R.	SCHMIDT	AUSTRIAN ACAD OF SCI

BRIEF DESCRIPTION

A 2-pi field-of-view electrostatic analyzer measured natural electron fluxes in the 0.1- to 12.0-keV range in order to study (1) the precipitation process in auroral emission, (2) the effects of the electron accelerator (SEPAC) operations on the natural electron fluxes, (3) the influence of the Shuttle/Spacelab generated atmosphere on the natural electron flux, and (4) the natural electron flux as a sensitive probe of the surface charge on the STS/Spacelab. The equipment consisted of an electrostatic deflection device with a hemispheric field of view and with azimuth and pitch-angle resolution, and eight continuous-channel electron multipliers for detectors. Approximately 90% of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, WILLSON-------------------------

INVESTIGATION NAME- ACTIVE CAVITY RADIOMETER SOLAR IRRADIANCE MONITOR

NSSDC ID- 83-116A-04

INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - R.C.	WILLSON	NASA-JPL
OI - R.	BEER	NASA-JPL
OI - J.M.	KENDALL, SR.	NASA-JPL

BRIEF DESCRIPTION

The objective of the active cavity radiometer irradiance monitor experiment was to measure the total solar irradiance with state-of-the-art accuracy and precision. The solar irradiance from far ultraviolet through far infrared wavelengths was measured by three type-V, active-cavity radiometer detectors. These detectors were electrically self-calibrated, cavity pyrheliometers each capable of defining the absolute radiation scale with an uncertainty of plus or minus 0.1%. The three detectors were independently shuttered, and their cycles of operation were different. The three detectors were used in various combinations to provide periodic cross references on the system's performance. Approximately 90% of the planned objectives were accomplished.

------- STS 9/SPACELAB 1, YOUNG-------------------------

INVESTIGATION NAME- VESTIBULAR STUDIES

NSSDC ID- 83-116A-13

INVESTIGATIVE PROGRAM
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - L.R.	YOUNG	MASS INST OF TECH
OI - G.M.	JONES	MCGILL U
OI - R.E.	MALCOLM	D+C INST OF ENVIRN MED
OI - K.E.	MONEY	D+C INST OF ENVIRN MED
OI - C.M.	OMAN	MASS INST OF TECH
OI - D.G.D.	WATT	MCGILL U
OI - J.M.	BINSACK	MASS INST OF TECH
OI - E.A.	BOUGHAN	MASS INST OF TECH

BRIEF DESCRIPTION

The vestibular studies were designed to investigate (1) space motion sickness, (2) visual-vestibular-tactile interactions during weightlessness, and (3) post-flight carry-over of weightlessness effects. The instrumentation for these studies included the body restraint system of Experiment 41 (Von Baumgarten), a rotating dome, a "hop and drop" station which allowed subjects to be accelerated towards the floor, and various recording devices. Approximately 90% of the planned objectives were accomplished.

************************** TENMA **************************

SPACECRAFT COMMON NAME- TENMA
ALTERNATE NAMES- X-RAY OBSERVATION SAT., 13829
ASTRO-B

NSSDC ID- 83-011A

LAUNCH DATE- 02/20/83 WEIGHT- 216. KG
LAUNCH SITE- KAGOSHIMA SPACE CENTER, JAPAN
LAUNCH VEHICLE- M-3S-3

SPONSORING COUNTRY/AGENCY
JAPAN ISAS

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 02/21/83
ORBIT PERIOD- 94.5 MIN	INCLINATION- 31.5 DEG
PERIAPSIS- 489. KM ALT	APOAPSIS- 503. KM ALT

PERSONNEL

PM - Y.	TANAKA	ISAS
PS - J.	NISHIMURA	ISAS

BRIEF DESCRIPTION

This X-ray astronomy mission had the following major objectives: (1) study of X-ray source spectra with good energy resolution, (2) study of temporal variations of X-ray sources, (3) all-sky survey for X-ray bursts and transients, and (4) observation of soft X-ray sources with a reflecting telescope. The spacecraft could spin at 0.546, 0.137, or 0.068 rpm with the aid of a momentum wheel. The spin axis was maneuvered by magnetic torquing.

------- TENMA, MIYAMOTO-------------------------

INVESTIGATION NAME- HADAMARD TRANSFORM TELESCOPE

NSSDC ID- 83-011A-02

INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

PI - S.	MIYAMOTO	OSAKA U
OI - K.	YAMASHITA	OSAKA U
OI - H.	TSUNEMI	OSAKA U

BRIEF DESCRIPTION

A wide-angle FOV Hadamard transform telescope, looking parallel to the spacecraft spin axis, monitored X-ray bursts and transients.

------- TENMA, MIYAMOTO-------------------------

INVESTIGATION NAME- ALL SKY X-RAY MONITOR

NSSDC ID- 83-011A-03

INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

PI - S.	MIYAMOTO	OSAKA U
OI - K.	YAMASHITA	OSAKA U
OI - H.	TSUNEMI	OSAKA U

BRIEF DESCRIPTION

A pair of proportional counters, with a fan-beam FOV, was used on the spinning spacecraft to provide an all-sky monitor.

------- TENMA, TANAKA-------------------------

INVESTIGATION NAME- GAS SCINTILLATION PROPORTIONAL COUNTERS (GSPC)

NSSDC ID- 83-011A-01 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

PI - Y.	TANAKA	ISAS
OI - M.	MATSUOKA	ISAS
OI - Y.	OGAWARA	ISAS
OI - T.	MURAKAMI	ISAS
OI - K.	KOYAMA	ISAS
OI - H.	INOUE	ISAS
OI - K.	MAKISHIMA	ISAS
OI - T.	OHASHI	ISAS

BRIEF DESCRIPTION

A cluster of 10 gas scintillation proportional counters (GSPCs), having an effective area of 800 sq cm, was used to obtain the energy spectra of X-ray sources with an energy resolution that was a factor of 2 better than that of conventional proportional counters. Two GSPCs were equipped with modulation collimators.

------- TENMA, YAMASHITA---------------------------------------

INVESTIGATION NAME- X-RAY REFLECTING TELESCOPE

NSSDC ID- 83-011A-04 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

PI - K.	YAMASHITA	OSAKA U
OI - F.	MAKINO	ISAS
OI - F.	NAGASE	NAGOYA U
OI - H.	KUNIEDA	ISAS
OI - Y.	TAWARA	ISAS

BRIEF DESCRIPTION

A one-dimensional reflecting telescope pointed along the spacecraft spin axis. The focal length of the telescope was 60 cm and the effective area was 15 sq cm.

*************************** TIP 1 ***************************

SPACECRAFT COMMON NAME- TIP 1
ALTERNATE NAMES- TRIAD 1, TRIAD OI 1X
TRIAD A, 06173
TRIAD

NSSDC ID- 72-069A

LAUNCH DATE- 09/02/72 WEIGHT- 94. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- SCOUT

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-NAVY

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 09/04/72
ORBIT PERIOD- 100.7 MIN INCLINATION- 90.1 DEG
PERIAPSIS- 716.0 KM ALT APOAPSIS- 863.0 KM ALT

PERSONNEL

PM - J.	DASSOULAS	APPLIED PHYSICS LAB
PS - R.E.	FISCHELL	APPLIED PHYSICS LAB

BRIEF DESCRIPTION

This three-body spacecraft was connected by booms which served as gravity-gradient stabilizers in the radial direction. A momentum wheel was used for stabilization in roll and yaw. The primary function of the spacecraft was to test various concepts for improving the USN Transit Navigation System. The power was supplied by a radioisotope thermal electric generator.

------- TIP 1, POTEMRA---------------------------------------

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETER

NSSDC ID- 72-069A-01 INVESTIGATIVE PROGRAM
NAVIGATION TECHNOLOGY

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - T.A. POTEMRA APPLIED PHYSICS LAB

BRIEF DESCRIPTION

This experiment consisted of a triaxial fluxgate magnetometer designed to measure vector fields with magnitudes up to 5.E4 nT. Measurements were made by sampling each axis sequentially at a rate of 2.25 samples/s. Digitization resolution was about 10 nT, as given by a 13-bit analog-to-digital converter, but zero-level drifts were not readily checked. Therefore, the experiment was most useful in studies of magnetic fluctuations. Due to the real-time data transmission and the locations of the tracking stations, most of the data obtained related to northern and southern hemisphere high latitudes.

*************************** UOSAT ***************************

SPACECRAFT COMMON NAME- UOSAT
ALTERNATE NAMES- 12888

NSSDC ID- 81-100B

LAUNCH DATE- 10/06/81 WEIGHT- 54. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA 2310

SPONSORING COUNTRY/AGENCY
UNITED STATES AMSAT
UNITED KINGDOM U OF SURR

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 10/07/81
ORBIT PERIOD- 95.4 MIN INCLINATION- 97.5 DEG
PERIAPSIS- 536. KM ALT APOAPSIS- 561. KM ALT

PERSONNEL

MG - D.	DANIELS	NASA HEADQUARTERS
SC - J.A.	KING	AMSAT CORP
PM - M.N.	SWEETING	U OF SURREY
PS - R.A.	PARISE	AMSAT CORP

BRIEF DESCRIPTION

The experiments selected to be part of the UOSAT payload had several objectives which included the following: to provide the educational community with an operational scientific satellite which could be utilized with a minimal ground station; to provide the scientific community with a new source of data to aid in the understanding of the electro-magnetic properties of the near earth environment; and to provide the amateur radio community with a full complement of instruments for the study and monitoring of radio propagation conditions from the high frequency to microwave. In order to meet these objectives the following instruments comprised the UOSAT payload: a triaxial fluxgate magnetometer with a resolution of plus or minus 2 nT and maximum vector sample rate of 6.25 per s; two charged particle counters with threshold energies of 20 and 60 keV; four phase-referenced high-frequency beacons at 7, 14, 21, and 28 MHz; two microwave beacons at 2.4 and 10.47 GHz; and a CCD earth-imaging camera with 2 km resolution, and spectral response of 0.4 -1.0 micrometers. One VHF and one UHF telemetry channel provided data in standard FSK ASCII at a variety of baud rates, as well as Morse code and synthesized voice formats.

------- UOSAT, ACUNA---------------------------------------

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETER

NSSDC ID- 81-100B-01 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - M.H. ACUNA NASA-GSFC

BRIEF DESCRIPTION

The magnetometer provided vector measurements of the earth's magnetic field. The output of the experiment consisted of a vector sample of the field approximately once every second. Each measurement cycle provided three analog signals representing the magnetic field components Bx, By, and Bz, as well as three 16-bit digital versions of these values. The onboard computer was sent a series of seven 10-ms strobe pulses. These seven strobe pulses occurred at 20-ms intervals giving a calibration word and the most significant byte (msb) and the least significant byte (lsb) of the magnetic field components, Bx msb, By msb, Bz msb, Bx lsb, By lsb, and Bz lsb. Thus the complete sample length was 160 ms of each s. Each vector component was represented by 16 bits of which 1 count equaled 2 nT and the dynamic range was 2 to the 15th power. The maximum sample rate at a spacecraft bit rate of 1.2 kbs was 6.25 vector samples per s.

------- UOSAT, FEREBEE---------------------------------------

INVESTIGATION NAME- CHARGED PARTICLE

NSSDC ID- 81-100B-03 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - I.C.	FEREBEE	U OF SURREY
OI - D.R.	LEPINE	RUTHERFORD APPLETON L.
OI - D.A.	BRYANT	RUTHERFORD APPLETON L.
OI - P.	GUTTRIDGE	MULLARD SPACE SCI LAB

BRIEF DESCRIPTION
The system incorporated two Geiger counters with electron threshold energies of 20 and 60 keV. These energies were chosen to give good resolution of auroral activity for the study of VHF radio propagation effects. The instrument output was in the form of a 12-bit count supplied to the onboard computer at a maximum rate of once every 200 ms.

------- UOSAT, SMITHERS---

INVESTIGATION NAME- HIGH FREQUENCY BEACON

NSSDC ID- 81-100B-04 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES AND RADIO PHYSICS

PERSONNEL
PI - C.W. SMITHERS U OF SURREY
OI - M.J. UNDERHILL U OF SURREY

BRIEF DESCRIPTION
The objectives of this experiment were the investigation of trans-ionospheric propagation of HF radio signals and the measurement of ionospheric electron column densities by phase-referenced observations at multiple frequencies. The instrument transmitter radiated up to four phase-referenced HF signals simultaneously. These signals were all synthesized from the same oscillator using frequency division techniques. The approximate frequencies chosen for the experiment were 7, 14, 21, and 28 MHz.

------- UOSAT, SWEETING---

INVESTIGATION NAME- EARTH IMAGING

NSSDC ID- 81-100B-02 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL
PI - M.N. SWEETING U OF SURREY

BRIEF DESCRIPTION
The video display and imaging system consisted of a CCD camera and a 256-kilobit video memory. Snapshot pictures of the earth's surface covering 512 x 512 km were taken by the camera and stored in the video memory for subsequent transmission to the ground. The onboard computer could have access to the video memory enabling onboard picture processing and graphic display of computer data. Each image contained 256 x 256 pixels, with a resolution of 2 km per pixel, and a spectral response of 0.4 -1.0 micrometers. Picture data were transmitted at 1.2 kbs synchronously with a 32-bit sync word at the beginning of each line.

------- UOSAT, SWEETING---

INVESTIGATION NAME- MICROWAVE BEACON

NSSDC ID- 81-100B-05 INVESTIGATIVE PROGRAM
CODE EC/CO-OP

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS

PERSONNEL
PI - M.N. SWEETING U OF SURREY

BRIEF DESCRIPTION
Beacons at 2.4 and 10.47 GHz were used to demonstrate the feasibility of using the higher frequency bands in transponder applications for future amateur communications spacecraft and to encourage the development of relatively inexpensive microwave ground station equipment by amateurs. The spacecraft-to-ground transmission link budget was very marginal, and required considerable skill to overcome Doppler and azimuth-elevation tracking requirements.

**************************** UOSAT 2 ****************************

SPACECRAFT COMMON NAME- UOSAT 2
ALTERNATE NAMES- 14781

NSSDC ID- 84-021B

LAUNCH DATE- 03/01/84 WEIGHT- KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
UNITED STATES AMSAT
UNITED KINGDOM U OF SURR

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 03/02/84
ORBIT PERIOD- 98.5 MIN INCLINATION- 98.3 DEG
PERIAPSIS- 678. KM ALT APOAPSIS- 696. KM ALT

PERSONNEL
MG - D. DANIELS NASA HEADQUARTERS
SC - J.A. KING AMSAT CORP
PM - M.N. SWEETING U OF SURREY
PS - R.A. PARISE AMSAT CORP

BRIEF DESCRIPTION
The experiments selected to be part of the UOSAT 2 payload had several objectives which included the following: to provide the educational community with an operational scientific satellite which could be utilized with a minimal ground station; to provide the scientific community with a new source of data to aid in the understanding of the electro-magnetic properties of the near earth environment; and to provide the amateur radio community with a full complement of instruments for the study and monitoring of radio propagation conditions from high frequency to microwave. In order to meet these objectives the following instruments comprised the UOSAT 2 payload; a triaxial fluxgate magnetometer with a resolution of plus or minus 2 nT and maxiumum vector sample rate of 6.25 per s; two charged particle counters with threshold energies of 20 and 60 keV; four phase-referenced high-frequency beacons at 7, 14, 21, and 28 MHz; two microwave beacons at 2.4 and 10.47 GHz; and a CCD earth-imaging camera with 2 km resolution, and spectral response of 0.4 -1.0 micrometers. One VHF and one UHF telemetry channel provided data in standard FSK ASCII at a variety of baud rates, as well as Morse code and synthesized voice formats. Though the descriptions are the same, there were some differences between UOSAT 2 and UOSAT experiments.

------- UOSAT 2, ACUNA---

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETER

NSSDC ID- 84-021B-01 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - M.H. ACUNA NASA-GSFC

BRIEF DESCRIPTION
The magnetometer provided vector measurements of the earth's magnetic field. The output of the experiment consisted of a vector sample of the field approximately once every second. Each measurement cycle provided three analog signals representing the magnetic field components Bx, By, and Bz, as well as three 16-bit digital versions of these values. The onboard computer was sent a series of seven 10-ms strobe pulses. These seven strobe pulses occurred at 20-ms intervals giving a calibration word and the most significant byte (msb) and the least significant byte (lsb) of the magnetic field components, Bx msb, By msb, Bz msb, Bx lsb, By lsb, and Bz lsb. Thus the complete sample length was 160 ms of each s. Each vector component was represented by 16 bits of which 1 count equaled 2 nT and the dynamic range was 2 to the 15th power. The maximum sample rate at a spacecraft bit rate of 1.2 kbs was 6.25 vector samples per s.

------- UOSAT 2, FEREBEE---

INVESTIGATION NAME- CHARGE PARTICLES

NSSDC ID- 84-021B-03 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - I.C. FEREBEE U OF SURREY
OI - P. GUTTRIDGE MULLARD SPACE SCI LAB
OI - D.R. LEPINE RUTHERFORD APPLETON L.
OI - D.A. BRYANT RUTHERFORD APPLETON L.

BRIEF DESCRIPTION
The system incorporated two Geiger counters with electron threshold energies of 20 and 60 keV. These energies were chosen to give good resolution of auroral activity for the study of VHF radio propagation effects. The instrument output was in the form of a 12-bit count supplied to the onboard computer at a maximum rate of once every 200 ms.

------- UOSAT 2, SMITHERS---

INVESTIGATION NAME- HIGH FREQUENCY BEACON

ORIGINAL PAGE IS
OF POOR QUALITY

NSSDC ID- 84-021B-04 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES AND RADIO PHYSICS

PERSONNEL
PI - C.W. SMITHERS U OF SURREY
OI - M.J. UNDERHILL U OF SURREY

BRIEF DESCRIPTION
The objectives of this experiment were the investigation of trans-ionospheric propagation of HF radio signals and the measurement of ionospheric electron column densities by phase-referenced observations at multiple frequencies. The instrument transmitter radiated up to four phase-referenced HF signals simultaneously. These signals were all synthesized from the same oscillator using frequency division techniques. The approximate frequencies chosen for the experiment were 7, 14, 21, and 28 MHz.

------- UOSAT 2, SWEETING--

INVESTIGATION NAME- EARTH IMAGING

NSSDC ID- 84-021B-02 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL
PI - M.N. SWEETING U OF SURREY

BRIEF DESCRIPTION
The video display and imaging system consisted of a CCD camera and a 256-kilobit video memory. Snapshot pictures of the earth's surface covering 512 x 512 km were taken by the camera and stored in the video memory for subsequent transmission to the ground. The onboard computer could have access to the video memory enabling onboard picture processing and graphic display of computer data. Each image containted 256 x 256 pixels, with a resolution of 2 km per pixel, and a spectral response of 0.4 to 1.0 micrometers. Picture data were transmitted at 1.2 kbs synchronously with a 32-bit sync word at the beginning of each line.

------- UOSAT 2, SWEETING--

INVESTIGATION NAME- MICROWAVE BEACON

NSSDC ID- 84-021B-05 INVESTIGATIVE PROGRAM
CODE EC/CO-OP

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS

PERSONNEL
PI - M.N. SWEETING U OF SURREY

BRIEF DESCRIPTION
Beacons at 2.4 and 10.47 GHz were used to demonstrate the feasibility of using the higher frequency bands in transponder applications for future amateur communications spacecraft and to encourage the development of relatively inexpensive microwave ground station equipment by amateurs. The spacecraft-to-ground transmission link budget was very marginal, and required considerable skill to overcome Doppler and azimuth-elevation tracking requirements.

*************************** VEGA 1***************************

SPACECRAFT COMMON NAME- VEGA 1
ALTERNATE NAMES- VENERA-HALLEY 1

NSSDC ID- 84-125A

LAUNCH DATE- 12/15/84 WEIGHT- 125. KG
LAUNCH SITE- TYURATAM (BAIKONUR COSMODROME), U.S.S.R.
LAUNCH VEHICLE- PROTON

SPONSORING COUNTRY/AGENCY
U.S.S.R. SAS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- VENUS FLYBY/COMET RENDEZVOUS

PERSONNEL
PM - UNKNOWN
PS - UNKNOWN

BRIEF DESCRIPTION
This spacecraft mission combined a Venus swingby and a Comet Halley flyby. Two identical spacecraft, VEGA 1 and VEGA 2, were launched December 15 and 21, 1984, respectively. After carrying Venus entry probes to the vicinity of Venus (arrival and deployment of probes were scheduled for June 11-15, 1985), the two spacecraft were to be retargetted using Venus gravity field assistance to intercept Comet Halley in March 1986. The first spacecraft was to encounter Comet Halley on March 6, 1986, and the second about three days later. The flyby velocity was to be 77.7 km/s. Although the spacecraft could be targetted with a precision of 100 km, the position of the spacecraft relative to the comet nucleus was estimated to be known only to within a few thousand kilometers. This, together with the problem of dust protection, led to estimated flyby distances of 10,000 km for the first spacecraft and 3000 km for the second. The spacecraft was three-axis stabilized. Its main features were large solar panels, a high-gain antenna dish, and an automatic pointing platform carrying those experiments that required pointing at the comet nucleus. The automatic platform could rotate through + or -110 deg and + or -40 deg in two perpendicular directions with a pointing accuracy of 5 arc-min and a stability of 1 arc-min/s. It carried the narrow- and the wide-angle camera, the three-channel spectrometer, and the infrared sounder. All other experiments were body-mounted, with the exception of two magnetometer sensors and various plasma probes and plasma wave analyzers which were mounted on a 5-m boom. The total scientific payload weighed 125 kg and had a data rate of 65 kbs in fast telemetry mode for encounter. There was also a slow telemetry mode for the cruise mode. The comet-encounter science data-take was from 2.5 h before until 0.5 h after the closest approach, with several periods of data-take before and after, each lasting about 2 h. Continuous coverage for plasma and dust instruments was provided by an onboard memory (5-megabit tape recorder). The spacecraft was shielded from hypervelocity dust impacts by a shield consisting of a 100-micrometer multilayer sheet 20 to 30 cm from the spacecraft, and a 1-mm Al sheet 5 to 10 cm from the spacecraft. Approximately half of the VEGA spacecraft was devoted to the Halley module, and half to the Venus lander package. The total scientific payload weight was 144.3 kg. The Venus package consisted of a sphere 240 cm in diameter, which was to be separated two days before arrival at Venus and enter the planet's atmosphere on an inclined path, without active maneuvers, as was done on previous VENERA missions. The lander probe was identical to those of VENERA 9 through 14 and similarly had two objectives, the study of the atmosphere and the study of the superficial crust. In addition to temperature and pressure measuring instruments, the descent probe carried a UV spectrometer for measurement of minor atmospheric constituents, an instrument dedicated to measurement of the concentration of H2O, and other instruments for determination of the chemical composition of the condensed phase: a gas-phase chromatograph; an X-ray spectrometer observing the fluorescence of grains or drops; and a mass spectrograph measuring the chemical composition of the grains or drops. The X-ray spectrometer separated the grains according to their sizes using a laser imaging device, while the mass spectrograph separated them according to their sizes using an aerodynamical inertial separator. After landing, a small surface sample near the probe was to be analyzed by gamma spectroscopy and X-ray fluorescence. The UV spectrometer, the mass spectrograph, and the pressure- and temperature-measuring instruments were developed in cooperation between French and Soviet investigators. In addition to the lander probe, a constant-pressure instrumented balloon was to be deployed immediately after entry into the atmosphere. The balloon, with a 5-kg payload and 25-kg total mass, was to float at approximately 50 km altitude in the middle, most active layer of the Venus three-tiered cloud system. Data from the balloon instruments were to be transmitted directly to Earth for the 60-h lifetime of the batteries. Onboard instruments were to measure temperature, pressure, vertical wind velocity, and visibility (density of local aerosols). Very long baseline interferometry was to be used to track the motion of the balloon to provide the wind velocity in the clouds. The tracking was to be done by a 6-station network on Soviet territory and by a network of 12 stations distributed world-wide (organized by France and the NASA Deep Space Network).

------- VEGA 1, BERTAUX--

INVESTIGATION NAME- DUST MASS SPECTROMETER

NSSDC ID- 84-125A-04 INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST
DUST

PERSONNEL
PI - J.L. BERTAUX CNRS-SA
OI - R.Z. SAGDEEV IKI
OI - J. KISSEL MPI-NUCLEAR PHYS

BRIEF DESCRIPTION
This investigation (PUMA) was designed to estimate the mass and chemical composition of particles in the dust coma. A similar instrument will be flown on the Giotto spacecraft. The instrument was mounted parallel to the relative velocity vector and analyzed the chemical and isotopic composition of individual dust particles. Impact of a dust particle on the instrument's silver target area caused a plasma to be formed consisting of dust and target material, from which ions were extracted by a 1.5-kV electric field. The ions traveled through a time-of-flight tube (actually two tubes with an electrostatic reflector between, with total length of 1 m) where they were separated according to their mass before being recorded by an electron multiplier. The ion mass range was 1 to 100 u, with resolution M/(delta M) of 200. The instrument observed the spectra of the most common dust particles, which were expected to be in the size range 100 to 10,000 nm. The

instrument was sensitive to dust particles in the mass range 3E-16 to 5E-10 g.

------- VEGA 1, CRIFO---

INVESTIGATION NAME- INFRARED SOUNDER

NSSDC ID- 84-125A-03 INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
INTERPLANETARY DUST
DUST

PERSONNEL

PI - J.F.	CRIFO	CNES
OI - V.I.	MOROZ	SOVIET ACAD OF SCI

BRIEF DESCRIPTION

The objectives for this instrument (IKS) were to determine (1) the size, radiation capacity, and temperature of the nucleus, (2) the nature, density, distribution, and temperature of the dust, and (3) the nature, relative content, and temperature of the parent molecules of Comet Halley. The instrument had a Cassegrain telescope with a focal length of 500 mm, a diameter of 140 mm, and a field of view of 1 deg. The radiation flux was separated into three beams, each of which passed through its own filter located on a wheel spinning at up to 20 rpm. Two of the channels were devoted to the spectroscopic mode in the wavelength intervals 4000 to 8000 and 8000 to 16,000 nm. The third channel was devoted to nucleus imaging at 7000 to 14,000 nm. Three Hg-Cd-Te photoconductors cooled to 80 deg K by liquid nitrogen were used as detecting devices.

------- VEGA 1, CRUVELIER---

INVESTIGATION NAME- WIDE- AND NARROW-ANGLE CAMERAS

NSSDC ID- 84-125A-01 INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
ASTRONOMY

PERSONNEL

PI - P.	CRUVELIER	CNES
OI - L.	SZABO	HUNGARIAN ACAD OF SCI
OI - G.	AVANESOV	SOVIET ACAD OF SCI

BRIEF DESCRIPTION

The television system (TVS) consisted of a wide-angle camera (WAC), a narrow-angle camera (NAC), and an electronics block. The WAC was to be used for large-scale coma imaging and as a guide for the NAC. The basic task of the NAC was imaging the nucleus and the surrounding area of Comet Halley; that of the WAC was directing the pointing platform and its instruments to the object of examination. Both cameras used CCDs with 512 x 576 pixels each as detecting devices in the focal plane. The combined data rate for the two cameras was 48 kbps, which was not sufficient to transmit the full contents of the CCDs. Only a "window" one-tenth of the area of the CCD, around the center of brightness, was transmitted. The exposure time had to be kept short to keep image blur to a minimum, but it could not be less than 0.01 s if good sensitivity was to be achieved. The narrow-angle camera could resolve nucleus surface structures down to 200 m from a distance of 10,000 km. A set of filters (500 to 1050 nm) with a relatively wide (80 nm) passband was used in the NAC. The WAC filter covered the range 630 to 760 nm. The NAC had a focal length of 1200 mm, an f-number of f/6, and a 0.5-deg field of view; for the WAC these parameters were 100 mm, f/2, and 4 deg, respectively. In addition to the purely scientific objectives of imaging the nucleus, the cameras also had the task of providing the information needed to determine the spacecraft's trajectory relative to the nucleus.

------- VEGA 1, GRARD---

INVESTIGATION NAME- LANGMUIR PROBE

NSSDC ID- 84-125A-11 INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS

PERSONNEL

PI - R.J.L.	GRARD	ESA-ESTEC
PI - C.	BEGHIN	CNRS, CTR FOR SPECTROM
CI - A.	PEDERSEN	ESA-ESTEC
CI - K.	KNOTT	ESA-ESTEC
CI - V.	FORMISANO	CNR, SPACE PLASMA LAB
CI - M.	MOGUILEVSKI	IZMIRAN
CI - Y.	MICHAILOV	IZMIRAN
CI - O.A.	MOLCHANOV	IZMIRAN

BRIEF DESCRIPTION

The primary objectives of this investigation (APV-V, or Epinoche, or Langmuir Probes and High Frequency Wave Analyzer) were (1) to measure the density of the solar wind just before it is influenced by cometary constituents, thereby establishing a reference for understanding the subsequent solar wind-comet interaction, (2) to observe the mass loading of the solar wind by cometary ions either directly or through the associated wave instabilities, (3) to obtain plasma density and temperature profiles, as well as wave frequency spectra during the cometary transit, (4) to search for the signatures of collision-free shocks and contact surfaces, and (5) to monitor the electric potential of the spacecraft during the flyby of the nucleus. The experimental equipment consisted of an electronics box (1400 g) and two booms mounted on the outer solar panels, which carry the sensors (2 x 800 g). Power consumption was 2 W and the maximum data transmission rate was 0.48 kbs. Electric fields were measured in the frequency range 0 to 300 kHz; the low frequency fluctuations were transmitted after direct sampling of the waveform; and the upper part of the spectrum, from 8 Hz to 300 kHz, was analyzed with a set of 16 adjacent and logarithmically spaced filters. The dynamic range of the electric field measurements was about 70 dB. The plasma density and temperature were measured with two Langmuir probes. The polarization voltage of one probe was kept at a fixed value of 5 V and the low frequency fluctuations of the electron current were analyzed in the frequency range 0 to 4 Hz by direct sampling of the waveform. The potential of the second probe was swept by a sinusoidal voltage with a period of 32 s superimposed on a dc voltage; the duration of the sweep, its amplitude and its average level could be modified by telecommand. The range of the density measurements was typically 10 to 1E4 per cc for a nominal electron mean kinetic energy of 1 eV. It was foreseen, however, that the effect of plasma emission from the spacecraft surface by impact of gas and dust would have to be carefully evaluated when interpreting the plasma measurements.

------- VEGA 1, GRINGAUZ---

INVESTIGATION NAME- ION MASS SPECTROMETER / ELECTRON ANALYZER

NSSDC ID- 84-125A-07 INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - K.I.	GRINGAUZ	SOVIET ACAD OF SCI
OI - L.I.	DENSHCHIKOVA	SOVIET ACAD OF SCI
OI - I.N.	KLIMENKO	SOVIET ACAD OF SCI
OI - A.P.	REMIZOV	SOVIET ACAD OF SCI
OI - G.A.	SKURIDIN	SOVIET ACAD OF SCI
OI - M.I.	VERIGIN	SOVIET ACAD OF SCI
OI - G.A.	VLADIMIROVA	SOVIET ACAD OF SCI
OI - G.I.	VOLKOV	SOVIET ACAD OF SCI
OI - I.	APATHY	HUNGARIAN ACAD OF SCI
OI - T.I.	GOMBOSI	HUNGARIAN ACAD OF SCI
OI - A.J.	SOMOGYI	CENT RES INST, PHYSICS
OI - L.	SZABO	HUNGARIAN ACAD OF SCI
OI - I.	SZEMEREY	HUNGARIAN ACAD OF SCI
OI - S.	SZENDRO	HUNGARIAN ACAD OF SCI
OI - E.	KEPPLER	MPI-AERONOMY
OI - A.K.	RICHTER	MPI-AERONOMY

BRIEF DESCRIPTION

This instrument (Plazmag) was designed to answer four main questions: (1) How do the solar wind parameters change as the comet is approached? (2) Does a near-cometary shock exist in the solar wind, and, if so, where is it and how do the plasma parameters change across it? (3) Where is the "contact surface" (the cometary ionosphere boundary) and what are the number density and chemical composition of the ions in the cometary ionosphere? (4) What is the chemical composition of the ions produced by photoionization of cometary neutral particles outside the contact discontinuity and even outside the bow shock and picked up by the solar wind? The instrument was composed of five detectors. (1) An ion spectrometer consisting of a hemispherical electrostatic energy analyzer with a quadrupole electrostatic lens at the aperture was pointed towards the sun, to measure solar wind ions at 30 energy levels logarithmically spaced between 50 eV and 25 keV. Energy resolution was 4%. The field of view was approximately a cone with a half-angle of 25 deg, and the flux range of the detector was from 5E4 to 5E9/(sq cm-s). (2) A similar ion spectrometer was oriented along the spacecraft-comet relative velocity vector and covered the energy range from 1? eV to 3.5 keV at 120 levels. Energy resolution was 4%. The field of view was approximately a cone with a half-angle of 6 deg. I the thermal velocities of the cometary ions were considerably lower than the encounter velocity, a mass spectrum in the range 1 to 100 u could be obtained. Mass resolution was 4%. The ion density measurements covered the range 1E-3 to 1E5/cc. In this detector the sensitivity could be decreased by a factor of 1000, and this was done for one full spectrum (1 s) every 4 s. (3) An electron detector with a cylindrical electrostatic analyzer was oriented with its aperture normal to the spacecraft-sun line and measured electrons in the energy range 3 to 5000 eV with energy resolution of 5%. The angular aperture was approximately + and -5 deg. This was used both

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for the measurement of solar wind electrons ahead of and behind the near-cometary shock and for the measurement of energetic electrons inside the cometary ionosphere. To determine the degree of degradation of the channeltron, a separate analyzer (with a tritium isotope particle source) using the same channeltron was operated for a short time once per day. To provide a larger dynamic range of measurements, an additional regime of measurements with sensitivity reduced by a factor of 100 was introduced for 0.5 s duration every 4 s, for the measurements of energies up to 30 eV. (4) An integral plane multigrid retarding potential analyzer (RPA) was directed toward the sun. A short honeycomb in front of the aperture protected it against impacting dust particles, and the field of view was + and -45 deg. (5) A similar RPA looked along the relative velocity vector, with a field of view of + and -8 deg. This RPA had no honeycomb, but the grids were replaced by relatively thick diaphragms with holes. This detector could be operated in four modes: (a) total ion flux was counted, including cometary ions, local environment, and background; (b) the same, but with ions of the local plasma environment retarded; (c) background only; and (d) the negative suppressor grid potential was replaced by positive 40 V, so that the collector current was due mainly to secondary electrons from the collector produced by cometary neutrals and dust particles. Detectors (1) through (3) yielded one spectrum per second, while the RPAs yielded eight current measurements per second. This was true for the encounter mode (3 h). Beginning 48 h before the encounter mode, the measurements were slower and sensitivities greater by a factor of 150. In the third mode, used during cruise, only the electron analyzer and the ion sensors pointed toward the sun were operated, and two spectra were measured by each spectrometer during 10 s every 20 min.

------- VEGA 1, KEPPLER-------------------------------------

INVESTIGATION NAME- NEUTRAL MASS SPECTROMETER

NSSDC ID- 84-125A-06

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - E.	KEPPLER	MPI-AERONOMY
OI - K.C.	HSIEH	U OF ARIZONA
OI - C.C.	CURTIS	U OF ARIZONA
OI - C.Y.	FAN	U OF ARIZONA
OI - D.M.	HUNTEN	U OF ARIZONA

BRIEF DESCRIPTION

This investigation, known as NGE (neutral gas experiment) or ING, measured the elemental and isotopic compositions of the neutral gases in the coma. The instrument was comprised of two mass spectrometers. These were known as EIS and FIS, according to their ionization sources. The EIS had an electron impact source of ionization, followed by an electrostatic analyzer, and covered the mass range 1 to 28 u, with resolution of approximately 4%. The FIS had a field ionization source, followed by a time-of-flight velocity analyzer, and covered the mass range 1 to 80 u. Its resolution was a function of the mass.

------- VEGA 1, MAZETS-------------------------------------

INVESTIGATION NAME- DUST PARTICLE PLASMA COUNTER

NSSDC ID- 84-125A-13

INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST
DUST

PERSONNEL

PI - E.P.	MAZETS	LENGRAD INST PHYS TECH

BRIEF DESCRIPTION

This instrument (SP-2) detected impacting dust particles in the mass range E-12 to E-18 g by observing the plasma clouds produced by the impacts.

------- VEGA 1, MOREELS-------------------------------------

INVESTIGATION NAME- THREE-CHANNEL SPECTROMETER

NSSDC ID- 84-125A-02

INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
ASTRONOMY

PERSONNEL

PI - G.	MOREELS	CNES
OI - M.M.	GOGOSHEV	CLSR-AO
OI - V.	KRASNAPOLSKII	SOVIET ACAD OF SCI

BRIEF DESCRIPTION

This experiment (TKS) was intended for (1) spectral and polarization studies of the dust, (2) spectral mapping of the coma, and (3) determination of the outflow rates of various gases from Comet Halley and their content. The instrument had a Cassegrain telescope with a focal length of 500 mm and an objective diameter of 140 mm. The light flux passed through three 1-deg slits located in the focal plane to three independent spectroscopic channels in the UV, visible, and infrared. The UV channel covered the range 120 to 350 nm, with spectral resolution of 0.5 nm, spatial resolution of 3 x 6 arc-min, and sensitivity of 3 rayleighs. The visible channel covered 350 to 900 nm, with spectral resolution of 1 nm, spatial resolution of 3 x 6 arc-min, and sensitivity of 10 rayleighs. The infrared channel covered 900 to 2000 nm, with spectral resolution of 10 to 12 nm, spatial resolution of 6 x 60 arc-min, and sensitivity of 3E4 rayleighs. The UV and visible channels used micro-channeltrons for detectors, while the infrared channel used a germanium photodiode.

------- VEGA 1, RIEDLER-------------------------------------

INVESTIGATION NAME- MAGNETOMETER

NSSDC ID- 84-125A-09

INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PARTICLES AND FIELDS
INTERPLANETARY MAGNETIC FIELDS

PERSONNEL

PI - W.W.	RIEDLER	AUSTRIAN ACAD OF SCI
OI - K.	SCHWINGENSCHUH	AUSTRIAN ACAD OF SCI
OI - R.	SCHMIDT	AUSTRIAN ACAD OF SCI
OI - YE.G.	YEROSHENKO	IZMIRAN
OI - V.A.	STJAZHKIN	IZMIRAN

BRIEF DESCRIPTION

This instrument, MISCHA (Magnetic Fields in Interplanetary Space during Comet Halley's approach), was designed to measure the constant component of the magnetic field and its low-frequency fluctuations in the cometary and solar wind interaction zone and in interplanetary space. The instrument consisted of two fluxgate sensor units mounted 1.5 m apart on a 5-m boom. One unit was oriented along the spacecraft axis, which was perpendicular to the solar panels and pointing toward the sun.

------- VEGA 1, SIMPSON-------------------------------------

INVESTIGATION NAME- DUST COUNTER AND MASS ANALYZER

NSSDC ID- 84-125A-12

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST
DUST

PERSONNEL

PI - J.A.	SIMPSON	U OF CHICAGO
OI - A.	TUZZOLINO	U OF CHICAGO
OI - R.Z.	SAGDEEV	IKI
OI - L.V.	KSANFOMALITI	IKI
OI - M.	PERKINS	U OF CHICAGO

BRIEF DESCRIPTION

This instrument, DUCMA (Dust Counter and Mass Analyzer), was designed to measure the fluxes of impacting dust particles with masses above the four threshold values of 1.5E-13, 9E-13, 9E-12, and 9E-11 g. The dust detector consisted of 75 sq cm of a 28-micrometer polarized polymer film, with conducting surfaces. This film, of polyvinylidene fluoride, had a permanent electric dipole moment per unit volume ("electret") with the polarization direction normal to the film surface. Destruction of the polarization along the path of the impacting particle produced a fast current pulse which was detected by a charge-sensitive amplifier. The magnitude of the signal was a known function of the mass and the velocity of the impacting particle. Because all of the dust particles impact with the flyby speed of 78 km/s, the electronically set thresholds corresponded to known mass values. There was a second similar detector, called the veto detector, which was protected from direct dust impacts and responded only to acoustic noises generated by activities of the spacecraft. This veto detector had two output channels, set at a low and a high threshold value. The ten counting rates of the instrument also included four single counting rate channels from the four thresholds of the dust detector, and the same four channels in anti-coincidence with either the low or the high level of the veto detector. The instrument was self-calibrating either periodically or upon command, and operated normally even when a portion of the detector was destroyed by large dust particles. It was calibrated at the Heidelberg dust accelerator up to velocities of 12 km/s. The counting rates for dust particles required no correction up to 1E4 particles/s, and only a small correction for 5E4 particles/s. The instrument was to be powered throughout the mission, so that after Venus encounter it was to search for interplanetary dust particles during the cruise mode. The detector was described by J. A. Simpson and A. J. Tuzzolino in Nuclear Instruments and Methods, in press, 1985. A description of the entire instrument is to be

------- VEGA 1, SOMOGYI---

INVESTIGATION NAME- ENERGETIC PARTICLES EXPERIMENT

NSSDC ID- 84-125A-08   INVESTIGATIVE PROGRAM
                              LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - A.J. SOMOGYI   CENT RES INST, PHYSICS

BRIEF DESCRIPTION
The objective of this investigation (TUNDE) was to study the solar wind interaction with the atmosphere and ionosphere of the Comet Halley. The instrument consisted of two semiconductor detectors plus an anti-coincidence scintillator to filter out particles from lateral directions. The device measured accelerated cometary ions in the energy range 20 keV to 20 MeV, and electrons from 175 keV to several MeV. The field of view was 30 deg, and the detector was oriented in the ecliptic plane.

------- VEGA 1, VAISBERG---

INVESTIGATION NAME- DUST IMPACT COUNTER

NSSDC ID- 84-125A-05   INVESTIGATIVE PROGRAM
                              LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST
DUST

PERSONNEL
PI - O.L. VAISBERG   IKI

BRIEF DESCRIPTION
This instrument (SP-1) consisted of three piezo-element detectors mounted on a special metallic plate to measure the amplitude of the wave generated by dust particles heavier than 1E-10 g impacting on the plate. The amplitude was proportional to the mass of the dust particle. From the arrival time of the pulse at the three detectors, the coordinates of the impact point could be determined. The dead time of the instrument depended on the acoustic decay of the signal in the piezo-elements and could turn out to be significant. The counter was oriented in the direction of the relative velocity vector.

------- VEGA 1, VOJTA---

INVESTIGATION NAME- WAVE ANALYZERS

NSSDC ID- 84-125A-10   INVESTIGATIVE PROGRAM
                              LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS

PERSONNEL

PI - J.	VOJTA		CZECH ACAD OF SCI
OI - Z.	KRAVCZYK		POLISH ACAD OF SCI
OI - S.	KILMOV		SOVIET ACAD OF SCI

BRIEF DESCRIPTION
This experiment (APV-N) was designed to study (1) the mechanism of anomalously high ionization of cometary gas, (2) the shock-front structure, and (3) the phenomena in the region of the contact surface (ionopause). The analyzer had a frequency range of 0.1 to 1000 Hz, and was designed to monitor waves excited in the cometary environment, in particular the lower hybrid waves (10 Hz) and ion cyclotron waves (1 Hz). A twin-probe technique was used to measure the potential difference between two probes placed on the 5-m boom isolated from the spacecraft. The plasma flow fluctuations were measured with a Faraday cup at the boom's tip.

************************ VEGA 2 ************************

SPACECRAFT COMMON NAME- VEGA 2
ALTERNATE NAMES- VENERA-HALLEY 2

NSSDC ID- 84-128A

LAUNCH DATE- 12/21/84   WEIGHT- 125. KG
LAUNCH SITE- TYURATAM (BAIKONUR COSMODROME), U.S.S.R.
LAUNCH VEHICLE- PROTON

SPONSORING COUNTRY/AGENCY
U.S.S.R.   SAS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- VENUS FLYBY/COMET RENDEZVOUS

PERSONNEL
PM - UNKNOWN
PS - UNKNOWN

BRIEF DESCRIPTION
This spacecraft mission combined a Venus swingby and a Comet Halley flyby. Two identical spacecraft, VEGA 1 and VEGA 2, were launched December 15 and 21, 1984, respectively. After carrying Venus entry probes to the vicinity of Venus (arrival and deployment of probes were scheduled for June 11-15, 1985), the two spacecraft were to be retargetted using Venus gravity field assistance to intercept Comet Halley in March 1986. The first spacecraft was to encounter Comet Halley on March 6, 1986, and the second about three days later. The flyby velocity was to be 77.7 km/s. Although the spacecraft could be targetted with a precision of 100 km, the position of the spacecraft relative to the comet nucleus was estimated to be known only to within a few thousand kilometers. This, together with the problem of dust protection, led to estimated flyby distances of 10,000 km for the first spacecraft and 3000 km for the second. The spacecraft was three-axis stabilized. Its main features were large solar panels, a high-gain antenna dish, and an automatic pointing platform carrying those experiments that required pointing at the comet nucleus. The automatic platform could rotate through + or -110 deg and + or -40 deg in two perpendicular directions with a pointing accuracy of 5 arc-min and a stability of 1 arc-min/s. It carried the narrow- and the wide-angle camera, the three-channel spectrometer, and the infrared sounder. All other experiments were body-mounted, with the exception of two magnetometer sensors and various plasma probes and plasma wave analyzers which were mounted on a 5-m boom. The total scientific payload weighed 125 kg and had a data rate of 65 kbs in fast telemetry mode for encounter. There was also a slow telemetry mode for the cruise mode. The comet-encounter science data-take was from 2.5 h before until 0.5 h after the closest approach, with several periods of data-take before and after, each lasting about 2 h. Continuous coverage for plasma and dust instruments was provided by an onboard memory (5-megabit tape recorder). The spacecraft was shielded from hypervelocity dust impacts by a shield consisting of a 100-micrometer multilayer sheet 20 to 30 cm from the spacecraft, and a 1-mm Al sheet 5 to 10 cm from the spacecraft. Approximately half of the VEGA spacecraft was devoted to the Halley module, and half to the Venus lander package. The total scientific payload weight was 144.3 kg. The Venus package consisted of a sphere 240 cm in diameter, which was to be separated two days before arrival at Venus and enter the planet's atmosphere on an inclined path, without active maneuvers, as was done on previous VENERA missions. The lander probe was identical to those of VENERA 9 through 14 and similarly had two objectives, the study of the atmosphere and the study of the superficial crust. In addition to temperature and pressure measuring instruments, the descent probe carried a UV spectrometer for measurement of minor atmospheric constituents, an instrument dedicated to measurement of the concentration of H_2O, and other instruments for determination of the chemical composition of the condensed phase: a gas-phase chromatograph; an X-ray spectrometer observing the fluorescence of grains or drops; and a mass spectrograph measuring the chemical composition of the grains or drops. The X-ray spectrometer separated the grains according to their sizes using a laser imaging device, while the mass spectrograph separated them according to their sizes using an aerodynamical inertial separator. After landing, a small surface sample near the probe was to be analyzed by gamma spectroscopy and X-ray fluorescence. The UV spectrometer, the mass spectrograph, and the pressure- and temperature-measuring instruments were developed in cooperation between French and Soviet investigators. In addition to the lander probe, a constant-pressure instrumented balloon was to be deployed immediately after entry into the atmosphere. The balloon, with a 5-kg payload and 25-kg total mass, was to float at approximately 50 km altitude in the middle, most active layer of the Venus three-tiered cloud system. Data from the balloon instruments were to be transmitted directly to Earth for the 60-h lifetime of the batteries. Onboard instruments were to measure temperature, pressure, vertical wind velocity, and visibility (density of local aerosols). Very long baseline interferometry was to be used to track the motion of the balloon to provide the wind velocity in the clouds. The tracking was to be done by a 6-station network on Soviet territory and by a network of 12 stations distributed world-wide (organized by France and the NASA Deep Space Network).

------- VEGA 2, BERTAUX---

INVESTIGATION NAME- DUST MASS SPECTROMETER

NSSDC ID- 84-128A-04   INVESTIGATIVE PROGRAM
                              LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST
DUST

OI - R.Z.	SAGDEEV	IKI
OI - J.	KISSEL	MPI-NUCLEAR PHYS

BRIEF DESCRIPTION

This investigation (PUMA) was designed to estimate the mass and chemical composition of particles in the dust coma. A similar instrument will be flown on the Giotto spacecraft. The instrument was mounted parallel to the relative velocity vector and analyzed the chemical and isotopic composition of individual dust particles. Impact of a dust particle on the instrument's silver target area caused a plasma to be formed consisting of dust and target material, from which ions were extracted by a 1.5-kV electric field. The ions traveled through a time-of-flight tube (actually two tubes with an electrostatic reflector between, with total length of 1 m) where they were separated according to their mass before being recorded by an electron multiplier. The ion mass range was 1 to 100 u, with resolution M/(delta M) of 200. The instrument observed the spectra of the most common dust particles, which were expected to be in the size range 100 to 10,000 nm. The instrument was sensitive to dust particles in the mass range 3E-16 to 5E-10 g.

------- VEGA 2, CRIFO--

INVESTIGATION NAME- INFRARED SOUNDER

NSSDC ID- 84-128A-03

INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
INTERPLANETARY DUST
DUST

PERSONNEL

PI - J.F.	CRIFO	CNES
OI - V.I.	MOROZ	SOVIET ACAD OF SCI

BRIEF DESCRIPTION

The objectives for this instrument (IKS) were to determine (1) the size, radiation capacity, and temperature of the nucleus, (2) the nature, density, distribution, and temperature of the dust, and (3) the nature, relative content, and temperature of the parent molecules of Comet Halley. The instrument had a Cassegrain telescope with a focal length of 500 mm, a diameter of 140 mm, and a field of view of 1 deg. The radiation flux was separated into three beams, each of which passed through its own filter located on a wheel spinning at up to 20 rpm. Two of the channels were devoted to the spectroscopic mode in the wavelength intervals 4000 to 8000 and 8000 to 16,000 nm. The third channel was devoted to nucleus imaging at 7000 to 14,000 nm. Three Hg-Cd-Te photoconductors cooled to 80 deg K by liquid nitrogen were used as detecting devices.

------- VEGA 2, CRUVELIER--

INVESTIGATION NAME- WIDE- AND NARROW-ANGLE CAMERAS

NSSDC ID- 84-128A-01

INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
ASTRONOMY

PERSONNEL

PI - P.	CRUVELIER	CNES
OI - L.	SZABO	HUNGARIAN ACAD OF SCI
OI - G.	AVANESOV	SOVIET ACAD OF SCI

BRIEF DESCRIPTION

The television system (TVS) consisted of a wide-angle camera (WAC), a narrow-angle camera (NAC), and an electronics block. The WAC was to be used for large-scale coma imaging and as a guide for the NAC. The basic task of the NAC was imaging the nucleus and the surrounding area of Comet Halley; that of the WAC was directing the pointing platform and its instruments to the object of examination. Both cameras used CCDs with 512 x 576 pixels each as detecting devices in the focal plane. The combined data rate for the two cameras was 48 kbps, which was not sufficient to transmit the full contents of the CCDs. Only a "window" one-tenth of the area of the CCD, around the center of brightness, was transmitted. The exposure time had to be kept short to keep image blur to a minimum, but it could not be less than 0.01 s if good sensitivity was to be achieved. The narrow-angle camera could resolve nucleus surface structures down to 200 m from a distance of 10,000 km. A set of filters (500 to 1050 nm) with a relatively wide (80 nm) passband was used in the NAC. The WAC filter covered the range 630 to 760 nm. The NAC had a focal length of 1200 mm, an f-number of f/6, and a 0.5-deg field of view; for the WAC these parameters were 100 mm, f/2, and 4 deg, respectively. In addition to the purely scientific objectives of imaging the nucleus, the cameras also had the task of providing the information needed to determine the spacecraft's trajectory relative to the nucleus.

INVESTIGATION NAME- LANGMUIR PROBE

NSSDC ID- 84-128A-11

INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS

PERSONNEL

PI - R.J.L.	GRARD	ESA-ESTEC
PI - C.	BEGHIN	CNRS, CTR FOR SPECTROM
CI - A.	PEDERSEN	ESA-ESTEC
CI - K.	KNOTT	ESA-ESTEC
CI - V.	FORMISANO	CNR, SPACE PLASMA LAB
CI - M.	MOGUILEVSKI	IZMIRAN
CI - Y.	MICHAILOV	IZMIRAN
CI - O.A.	MOLCHANOV	IZMIRAN

BRIEF DESCRIPTION

The primary objectives of this investigation (APV-V, or Epinoche, or Langmuir Probes and High Frequency Wave Analyzer) were (1) to measure the density of the solar wind just before it is influenced by cometary constituents, thereby establishing a reference for understanding the subsequent solar wind-comet interaction, (2) to observe the mass loading of the solar wind by cometary ions either directly or through the associated wave instabilities, (3) to obtain plasma density and temperature profiles, as well as wave frequency spectra during the cometary transit, (4) to search for the signatures of collision-free shocks and contact surfaces, and (5) to monitor the electric potential of the spacecraft during the flyby of the nucleus. The experimental equipment consisted of an electronics box (1400 g) and two booms mounted on the outer solar panels, which carry the sensors (2 x 800 g). Power consumption was 2 W and the maximum data transmission rate was 0.48 kbs. Electric fields were measured in the frequency range 0 to 300 kHz; the low frequency fluctuations were transmitted after direct sampling of the waveform, and the upper part of the spectrum, from 8 Hz to 300 kHz, was analyzed with a set of 16 adjacent and logarithmically spaced filters. The dynamic range of the electric field measurements was about 70 dB. The plasma density and temperature were measured with two Langmuir probes. The polarization voltage of one probe was kept at a fixed value of 5 V and the low frequency fluctuations of the electron current were analyzed in the frequency range 0 to 4 Hz by direct sampling of the waveform. The potential of the second probe was swept by a sinusoidal voltage with a period of 32 s superimposed on a dc voltage; the duration of the sweep, its amplitude and its average level could be modified by telecommand. The range of the density measurements was typically 10 to 1E4 per cc for a nominal electron mean kinetic energy of 1 eV. It was foreseen, however, that the effect of plasma emission from the spacecraft surface by impact of gas and dust would have to be carefully evaluated when interpreting the plasma measurements.

------- VEGA 2, GRINGAUZ---

INVESTIGATION NAME- ION MASS SPECTROMETER / ELECTRON ANALYZER

NSSDC ID- 84-128A-07

INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - K.I.	GRINGAUZ	SOVIET ACAD OF SCI
OI - L.I.	DENSHCHIKOVA	SOVIET ACAD OF SCI
OI - I.N.	KLIMENKO	SOVIET ACAD OF SCI
OI - A.P.	REMIZOV	SOVIET ACAD OF SCI
OI - G.A.	SKURIDIN	SOVIET ACAD OF SCI
OI - M.I.	VERIGIN	SOVIET ACAD OF SCI
OI - G.A.	VLADIMIROVA	SOVIET ACAD OF SCI
OI - G.I.	VOLKOV	SOVIET ACAD OF SCI
OI - I.	APATHY	HUNGARIAN ACAD OF SCI
OI - T.I.	GOMBOSI	HUNGARIAN ACAD OF SCI
OI - A.J.	SOMOGYI	CENT RES INST, PHYSICS
OI - L.	SZABO	HUNGARIAN ACAD OF SCI
OI - I.	SZEMEREY	HUNGARIAN ACAD OF SCI
OI - S.	SZENDRO	HUNGARIAN ACAD OF SCI
OI - E.	KEPPLER	MPI-AERONOMY
OI - A.K.	RICHTER	MPI-AERONOMY

BRIEF DESCRIPTION

This instrument (Plazmag) was designed to answer four main questions: (1) How do the solar wind parameters change as the comet is approached? (2) Does a near-cometary shock exist in the solar wind, and, if so, where is it and how do the plasma parameters change across it? (3) Where is the "contact surface" (the cometary ionosphere boundary) and what are the number density and chemical composition of the ions in the cometary ionosphere? (4) What is the chemical composition of the ions produced by photoionization of cometary neutral particles outside the contact discontinuity and even outside the bow shock and picked up by the solar wind? The instrument was composed of five detectors. (1) An ion spectrometer consisting of a hemispherical electrostatic energy analyzer

Energy resolution was 4%. The field of view was approximately a cone with a half-angle of 25 deg, and the flux range of the detector was from 5E4 to 5E9/(sq cm-s). (2) A similar ion spectrometer was oriented along the spacecraft-comet relative velocity vector and covered the energy range from 15 eV to 3.5 keV at 120 levels. Energy resolution was 4%. The field of view was approximately a cone with a half-angle of 6 deg. If the thermal velocities of the cometary ions were considerably lower than the encounter velocity, a mass spectrum in the range 1 to 100 u could be obtained. Mass resolution was 4%. The ion density measurements covered the range 1E-3 to 1E5/cc. In this detector the sensitivity could be decreased by a factor of 1000, and this was done for one full spectrum (1 s) every 4 s. (3) An electron detector with a cylindrical electrostatic analyzer was oriented with its aperture normal to the spacecraft-sun line and measured electrons in the energy range 3 to 5000 eV with energy resolution of 5%. The angular aperture was approximately + and -5 deg. This was used both for the measurement of solar wind electrons ahead of and behind the near-cometary shock and for the measurement of energetic electrons inside the cometary ionosphere. To determine the degree of degradation of the channeltron, a separate analyzer (with a tritium isotope particle source) using the same channeltron was operated for a short time once per day. To provide a larger dynamic range of measurements, an additional regime of measurements with sensitivity reduced by a factor of 100 was introduced for 0.5 s duration every 4 s, for the measurements of energies up to 30 eV. (4) An integral plane multigrid retarding potential analyzer (RPA) was directed toward the sun. A short honeycomb in front of the aperture protected it against impacting dust particles, and the field of view was + and -45 deg. (5) A similar RPA looked along the relative velocity vector, with a field of view of + and -8 deg. This RPA had no honeycomb, but the grids were replaced by relatively thick diaphragms with holes. This detector could be operated in four modes: (a) total ion flux was counted, including cometary ions, local environment, and background; (b) the same, but with ions of the local plasma environment retarded; (c) background only; and (d) the negative suppressor grid potential was replaced by positive 40 V, so that the collector current was due mainly to secondary electrons from the collector produced by cometary neutrals and dust particles. Detectors (1) through (3) yielded one spectrum per second, while the RPAs yielded eight current measurements per second. This was true for the encounter mode (3 h). Beginning 48 h before the encounter mode, the measurements were slower and sensitivities greater by a factor of 150. In the third mode, used during cruise, only the electron analyzer and the ion sensors pointed toward the sun were operated, and two spectra were measured by each spectrometer during 10 s every 20 min.

------- VEGA 2, KEPPLER---

INVESTIGATION NAME- NEUTRAL MASS SPECTROMETER

NSSDC ID- 84-128A-06

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - E.	KEPPLER	MPI-AERONOMY
OI - K.C.	HSIEH	U OF ARIZONA
OI - C.C.	CURTIS	U OF ARIZONA
OI - C.Y.	FAN	U OF ARIZONA
OI - D.M.	HUNTEN	U OF ARIZONA

BRIEF DESCRIPTION

This investigation, known as NGE (neutral gas experiment) or ING, measured the elements, and isotopic compositions of the neutral gases in the coma. The instrument was comprised of two mass spectrometers. These were known as EIS and FIS, according to their ionization sources. The EIS had an electron impact source of ionization, followed by an electrostatic analyzer, and covered the mass range 1 to 28 u, with resolution of approximately 4%. The FIS had a field ionization source, followed by a time-of-flight velocity analyzer, and covered the mass range 1 to 80 u. Its resolution was a function of the mass.

------- VEGA 2, MAZETS---

INVESTIGATION NAME- DUST PARTICLE PLASMA COUNTER

NSSDC ID- 84-128A-13

INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST
DUST

BRIEF DESCRIPTION

This instrument (SP-2) detected impacting dust particles in the mass range E-12 to E-18 g by observing the plasma clouds produced by the impacts.

------- VEGA 2, MOREELS---

INVESTIGATION NAME- THREE-CHANNEL SPECTROMETER

NSSDC ID- 84-128A-02

INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
ASTRONOMY

PERSONNEL

PI - G.	MOREELS	CNES
OI - M.M.	GOGOSHEV	CLSR-AO
OI - V.	KRASNAPOLSKII	SOVIET ACAD OF SCI

BRIEF DESCRIPTION

This experiment (TKS) was intended for (1) spectral and polarization studies of the dust, (2) spectral mapping of the coma, and (3) determination of the outflow rates of various gases from Comet Halley and their content. The instrument had a Cassegrain telescope with a focal length of 500 mm and an objective diameter of 140 mm. The light flux passed through three 1-deg slits located in the focal plane to three independent spectroscopic channels in the UV, visible, and infrared. The UV channel covered the range 120 to 350 nm, with spectral resolution of 0.5 nm, spatial resolution of 3 x 6 arc-min, and sensitivity of 3 rayleighs. The visible channel covered 350 to 900 nm, with spectral resolution of 1 nm, spatial resolution of 3 x 6 arc-min, and sensitivity of 10 rayleighs. The infrared channel covered 900 to 2000 nm, with spectral resolution of 10 to 12 nm, spatial resolution of 6 x 60 arc-min, and sensitivity of 3E4 rayleighs. The UV and visible channels used micro-channeltrons for detectors, while the infrared channel used a germanium photodiode.

------- VEGA 2, RIEDLER---

INVESTIGATION NAME- MAGNETOMETER

NSSDC ID- 84-128A-09

INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PARTICLES AND FIELDS
INTERPLANETARY MAGNETIC FIELDS

PERSONNEL

PI - W.W.	RIEDLER	AUSTRIAN ACAD OF SCI
OI - K.	SCHWINGENSCHUH	AUSTRIAN ACAD OF SCI
OI - R.	SCHMIDT	AUSTRIAN ACAD OF SCI
OI - YE.G.	YEROSHENKO	IZMIRAN
OI - V.A.	STJAZHKIN	IZMIRAN

BRIEF DESCRIPTION

This instrument, MISCHA (Magnetic Fields in Interplanetary Space during Comet Halley's approach), was designed to measure the constant component of the magnetic field and its low-frequency fluctuations in the cometary and solar wind interaction zone and in interplanetary space. The instrument consisted of two fluxgate sensor units mounted 1.5 m apart on a 5-m boom. One unit was oriented along the spacecraft axis, which was perpendicular to the solar panels and pointing toward the sun.

------- VEGA 2, SIMPSON---

INVESTIGATION NAME- DUST COUNTER AND MASS ANALYZER

NSSDC ID- 84-128A-12

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST
DUST

PERSONNEL

PI - J.A.	SIMPSON	U OF CHICAGO
OI - A.	TUZZOLINO	U OF CHICAGO
OI - R.Z.	SAGDEEV	IKI
OI - L.V.	KSANFOMALITI	IKI
OI - M.	PERKINS	U OF CHICAGO

BRIEF DESCRIPTION

This instrument, DUCMA (Dust Counter and Mass Analyzer), was designed to measure the fluxes of impacting dust particles with masses above the four threshold values of 1.5E-13, 9E-13, 9E-12, and 9E-11 g. The dust detector consisted of 75 sq cm of a 28-micrometer polarized polymer film, with conducting surfaces. This film, of polyvinylidene fluoride, had a permanent electric dipole moment per unit volume ("electret") with the polarization direction normal to the film surface. Destruction of the polarization along the path of the impacting particle produced a fast current pulse which was detected by a charge-sensitive amplifier. The magnitude of the signal was a

known function of the mass and the velocity of the impacting particle. Because all of the dust particles impact with the flyby speed of 78 km/s, the electronically set thresholds corresponded to known mass values. There was a second similar detector, called the veto detector, which was protected from direct dust impacts and responded only to acoustic noises generated by activities of the spacecraft. This veto detector had two output channels, set at a low and a high threshold value. The ten counting rates of the instrument also included four single counting rate channels from the four thresholds of the dust detector, and the same four channels in anti-coincidence with either the low or the high level of the veto detector. The instrument was self-calibrating either periodically or upon command, and operated normally even when a portion of the detector was destroyed by large dust particles. It was calibrated at the Heidelberg dust accelerator up to velocities of 12 km/s. The counting rates for dust particles required no correction up to 1E4 particles/s, and only a small correction for 5E4 particles/s. The instrument was to be powered throughout the mission, so that after Venus encounter it was to search for interplanetary dust particles during the cruise mode. The detector was described by J. A. Simpson and A. J. Tuzzolino in Nuclear Instruments and Methods, in press, 1985. A description of the entire instrument is to be published in Nuclear Instruments and Methods, 1985 or 1986.

------- VEGA 2, SOMOGYI---

INVESTIGATION NAME- ENERGETIC PARTICLES EXPERIMENT

NSSDC ID- 84-128A-08 INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - A.J. SOMOGYI CENT RES INST, PHYSICS

BRIEF DESCRIPTION
The objective of this investigation (TUNDE) was to study the solar wind interaction with the atmosphere and ionosphere of the Comet Halley. The instrument consisted of two semiconductor detectors plus an anti-coincidence scintillator to filter out particles from lateral directions. The device measured accelerated cometary ions in the energy range 20 keV to 20 MeV, and electrons from 175 keV to several MeV. The field of view was 30 deg, and the detector was oriented in the ecliptic plane.

------- VEGA 2, VAISBERG---

INVESTIGATION NAME- DUST IMPACT COUNTER

NSSDC ID- 84-128A-05 INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST
DUST

PERSONNEL
PI - O.L. VAISBERG IKI

BRIEF DESCRIPTION
This instrument (SP-1) consisted of three piezo-element detectors mounted on a special metallic plate to measure the amplitude of the wave generated by dust particles heavier than 1E-10 g impacting on the plate. The amplitude was proportional to the mass of the dust particle. From the arrival time of the pulse at the three detectors, the coordinates of the impact point could be determined. The dead time of the instrument depended on the acoustic decay of the signal in the piezo-elements and could turn out to be significant. The counter was oriented in the direction of the relative velocity vector.

------- VEGA 2, VOJTA---

INVESTIGATION NAME- WAVE ANALYZERS

NSSDC ID- 84-128A-10 INVESTIGATIVE PROGRAM
LUNAR AND PLANETARY

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS

PERSONNEL
PI - J. VOJTA CZECH ACAD OF SCI
OI - Z. KRAVCZYK POLISH ACAD OF SCI
OI - S. KLIMOV SOVIET ACAD OF SCI

BRIEF DESCRIPTION
This experiment (APV-N) was designed to study (1) the mechanism of anomalously high ionization of cometary gas, (2) the shock-front structure, and (3) the phenomena in the region of the contact surface (ionopause). The analyzer had a frequency range of 0.1 to 1000 Hz, and was designed to monitor waves excited in the cometary environment, in particular the lower hybrid waves (10 Hz) and ion cyclotron waves (1 Hz). A twin-probe technique was used to measure the potential difference between two probes placed on the 5-m boom isolated from the spacecraft. The plasma flow fluctuations were measured with a Faraday cup at the boom's tip.

*************************** VENERA 15***********************

SPACECRAFT COMMON NAME- VENERA 15
ALTERNATE NAMES- 14104

NSSDC ID- 83-053A

LAUNCH DATE- 06/02/83 WEIGHT- KG
LAUNCH SITE- TYURATAM (BAIKONUR COSMODROME), U.S.S.R.
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
U.S.S.R. SAS

ORBIT PARAMETERS
ORBIT TYPE- HELIOCENTRIC EPOCH DATE-
ORBIT PERIOD- DAYS INCLINATION- DEG
PERIAPSIS- AU RAD APOAPSIS- AU RAD

PERSONNEL
PM - UNKNOWN IKI
PS - UNKNOWN IKI

BRIEF DESCRIPTION
Venera 15 was part of a two spacecraft mision (along with Venera 16) designed to study the properties of Venus. Details of the spacecraft and its instrumentation were not known, but it was believed to be a Venus Orbiter carrying a Venus surface radar mapper. Information indicated that there was not a lander probe as part of this mission.

*************************** VENERA 16***********************

SPACECRAFT COMMON NAME- VENERA 16
ALTERNATE NAMES- 14107

NSSDC ID- 83-054A

LAUNCH DATE- 06/07/83 WEIGHT- KG
LAUNCH SITE- TYURATAM (BAIKONUR COSMODROME), U.S.S.R.
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
U.S.S.R. SAS

ORBIT PARAMETERS
ORBIT TYPE- HELIOCENTRIC EPOCH DATE-
ORBIT PERIOD- DAYS INCLINATION- DEG
PERIAPSIS- AU RAD APOAPSIS- AU RAD

PERSONNEL
PM - UNKNOWN IKI
PS - UNKNOWN IKI

BRIEF DESCRIPTION
Venera 16 was part of a two spacecraft mission (along with Venera 15) designed to study the properties of Venus. Details of the spacecraft and its instrumentation were not known, but it was believed to be a Venus Orbiter carrying a Venus surface mapper. Information indicated that there was not a lander probe as part of this mission.

*************************** VIKING 1 LANDER*****************

SPACECRAFT COMMON NAME- VIKING 1 LANDER
ALTERNATE NAMES- VIKING-B LANDER

NSSDC ID- 75-075C

LAUNCH DATE- 08/20/75 WEIGHT- 605. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- TITAN

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- MARS LANDER

PERSONNEL
MG - G.K. STROBEL NASA HEADQUARTERS
SC - J.M. BOYCE NASA HEADQUARTERS
PM - J.S. MARTIN(NLA) NASA-JPL
PS - G.A. SOFFEN(NLA) NASA-LARC

BRIEF DESCRIPTION
This spacecraft was the landing vehicle for the two-part Viking spacecraft mission. It soft-landed on July 20, 1976, in the Chryse region of Mars at 22.27 deg N latitude and 47.94 deg W longitude. The lander carried instruments to study the biology, chemical composition (organic and inorganic), meteorology, seismology, magnetic properties, surface appearance, and physical properties of the Martian surface and atmosphere. The lander had a 70-W power capacity and a scientific payload of approximately 91 kg (200 lb). Some of the data collected were returned by direct radio link to earth, but most of the data were returned by relay through one of the

orbiters. The lander was approximately 3 m across and about 2 m high. For a detailed description of the Viking mission and experiments see "Scientific Results of the Viking Project," J. Geophys. Res., v. 82, n. 28, 1977.

------- VIKING 1 LANDER, ARVIDSON------------------------------

INVESTIGATION NAME- LANDER IMAGING

NSSDC ID- 75-075C-06

INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
METEOROLOGY
PLANETOLOGY

PERSONNEL

PI	R.E.	ARVIDSON	WASHINGTON U
TM	T.A.	MUTCH(DECEASED)	NASA HEADQUARTERS
TM	C.	SAGAN	CORNELL U
TM	A.B.	BINDER	U OF KIEL
TM	E.C.	MORRIS	US GEOLOGICAL SURVEY
TM	F.O.	HUCK	NASA-LARC
TM	E.C.	LEVINTHAL	NUCLEAR REGULATORY COM
TM	S.	LIEBES, JR.	STANFORD U
TM	J.B.	POLLACK	NASA-ARC

BRIEF DESCRIPTION

The lander imaging experiment viewed the scene surrounding the lander, the surface sampler and other parts of the lander, the sun, Phobos, and Deimos to provide data for operational purposes and for geological and meteorological investigations. Two scanning cameras, capable of resolving 0.04 deg (high-resolution) or 0.12 deg (low-resolution, color, and IR) were used on each lander. Each image acquired covered a vertical field of 20 deg (high-resolution) or 60 deg (low-resolution, color, and IR) and a horizontal field that was commandable from 2.5 deg to 342.5 deg in 2.5-deg increments. Images were acquired from 40 deg above the nominal horizon to 60 deg below, and were commandable in 10-deg increments. The cameras were mounted 1.3 m above the nominal landing plane and were capable of viewing two footpads and most of the area accessible to the surface sampler. The two cameras were separated by 0.8 m, and stereoscopic pictures were obtained over most of the scene. Black-and-white images in either low or high resolution included radiation wavelengths from 0.4 to 1.1 micrometers. The use of a single detector to image an entire frame allowed a relative radiometric accuracy of plus or minus 10%. For more information concerning the cameras, see Huck et al., Space Science Instrumentation, v. 1, p. 189-214, 1975.

------- VIKING 1 LANDER, MICHAEL, JR.--------------------------

INVESTIGATION NAME- LANDER RADIO SCIENCE

NSSDC ID- 75-075C-11

INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
IONOSPHERES
PLANETARY ATMOSPHERES
PLANETOLOGY

PERSONNEL

TL	W.H.	MICHAEL, JR.	NASA-LARC
TM	I.I.	SHAPIRO	MASS INST OF TECH
TM	G.F.	LINDAL	NASA-JPL
TM	J.G.	DAVIES	U OF MANCHESTER
TM	D.L.	CAIN	NASA-JPL
TM	M.D.	GROSSI	RAYTHEON CORP
TM	G.L.	TYLER	STANFORD U
TM	J.P.	BRENKLE	NASA-JPL
TM	R.H.	TOLSON	NASA-LARC
TM	C.T.	STELZRIED	NASA-JPL
TM	G.	BORN	NASA-JPL
TM	R.	REASENBERG	MASS INST OF TECH

BRIEF DESCRIPTION

This experiment used the lander S-band radio transmitter to acquire Doppler and range data for the lander, utilizing the same Deep Space Network facilities that were used by the orbiters. The resulting data were used to determine the location of the lander on the planet's surface. They also provided more precise information about the orbital, rotational, and precessional motion of Mars than had previously been available. The two principal differences between orbiter and lander tracking data are (1) lander tracking periods were never longer than 2 h and were sometimes much shorter because of thermal constraints on the duration of lander transmitter operation, and (2) landers had no X-band signals to provide the corrections to range data for the interplanetary plasma effects. Consequently, lander ranging sessions were scheduled to be nearly simultaneous with orbiter ranging whenever possible, so that the orbiter S- and X-band data could supply these corrections.

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**************************** VOYAGER 1 ************************

SPACECRAFT COMMON NAME- VOYAGER 1
ALTERNATE NAMES- MARINER JUPITER/SATURN A, OUTER PLANETS A
MARINER 77A, MJS 77A
10321

NSSDC ID- 77-084A

LAUNCH DATE- 09/05/77 WEIGHT- 70? KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- TITAN

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- SATURN FLYBY

PERSONNEL

MG	R.	MILLS	NASA HEADQUARTERS
SC	W.A.	BRUNK(DECEASED)	NASA HEADQUARTERS
PM	R.P.	LAESER	NASA-JPL
PS	E.C.	STONE	CALIF INST OF TECH

BRIEF DESCRIPTION

The overall objectives of Voyager were to conduct exploratory investigations of the planetary systems of Jupiter and Saturn and of the interplanetary medium out to Saturn. Primary emphasis was placed on comparative studies of these two planetary systems by obtaining (1) measurements of the environment, atmosphere, and body characteristics of the planets and the satellites of each planet, (2) studies of the nature of the rings of Saturn, and (3) exploration of the interplanetary (or interstellar) medium at increasing distances from the sun. These objectives were attained by using a variety of instruments and methods including imaging, a coherent S- and X-band RF receiver, an infrared interferometer and radiometer, UV spectrometer, fluxgate magnetometers, Faraday cups, a charged-particle analyzer, plasma detector, plasma-wave radio receiver, cosmic-ray telescopes, photopolarimeter, and a sweep-frequency radio receiver. Voyager 1 had its closest encounter with Jupiter on March 5, 1979, and with Saturn on November 12, 1980.

------- VOYAGER 1, BRIDGE--------------------------------------

INVESTIGATION NAME- PLASMA SPECTROMETERS

NSSDC ID- 77-084A-06

INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI	H.S.	BRIDGE	MASS INST OF TECH
CI	J.W.	BELCHER	MASS INST OF TECH
CI	C.K.	GOERTZ	U OF IOWA
CI	A.J.	LAZARUS	MASS INST OF TECH
CI	S.	OLBERT	MASS INST OF TECH
CI	V.M.	VASYLIUNAS	MPI-AERONOMY
CI	L.F.	BURLAGA	NASA-GSFC
CI	R.E.	HARTLE	NASA-GSFC
CI	K.W.	OGILVIE	NASA-GSFC
CI	G.L.	SISCOE	U OF CALIF, LA
CI	A.J.	HUNDHAUSEN	NATL CTR FOR ATMOS RES
CI	J.D.	SULLIVAN	MASS INST OF TECH
CI	J.D.	SCUDDER	NASA-GSFC

BRIEF DESCRIPTION

The plasma investigation made use of two Faraday-cup detectors, one pointed along the earth-spacecraft line and one at right angles to this line. The earth-pointing detector determined the macroscopic properties of the plasma ions, obtaining accurate values of their velocity, density, and pressure. Three sequential energy scans were employed with (delta E)/E equal to 29, 7.2, and 1.8%, allowing a coverage from subsonic to highly supersonic flow. The side-looking Faraday cup measured electrons in the energy range from 5 eV to 1 keV.

------- VOYAGER 1, BROADFOOT-----------------------------------

INVESTIGATION NAME- ULTRAVIOLET SPECTROSCOPY

NSSDC ID- 77-084A-04

INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL

PI	A.L.	BROADFOOT	U OF SOUTHERN CALIF
CI	H.W.	MOOS	JOHNS HOPKINS U
CI	M.J.S.	BELTON	KITT PEAK NATL OBS
CI	D.F.	STROBEL	US NAVAL RESEARCH LAB
CI	T.M.	DONAHUE	U OF MICHIGAN
CI	M.B.	MCELROY	HARVARD U
CI	J.C.	MCCONNELL	YORK U
CI	R.M.	GOODY	HARVARD U
CI	A.	DALGARNO	SAO

NSSDC ID- 77-076A-11 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.L.	LANE	NASA-JPL
CI - K.D.	PANG	NASA-JPL
CI - J.E.	HANSEN	NASA-GISS
CI - D.L.	COFFEEN	NASA-GISS
CI - L.W.	ESPOSITO	U OF COLORADO
CI - M.	SATO(NLA)	NASA-GISS
CI - R.A.	WEST	U OF COLORADO
CI - C.W.	HORD	U OF COLORADO

BRIEF DESCRIPTION
This experiment consisted of an 8-in. (20-cm) f/1.1 telescope that sent radiation through a polarizer and a filter for one of eight bands in the 2200- to 7300-A spectral region, then on to a photomultiplier tube. By study of these emission intensity data, information on surface texture and composition of Jupiter, Saturn, Uranus, and Neptune could be obtained, along with information of size distribution and composition of Saturn's and Uranus' rings and information on atmospheric scattering properties and density for all planets. Molecular scale heights for these planets could also be determined from these data.

------- VOYAGER 2, NESS---

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETERS

NSSDC ID- 77-076A-05 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
PLANETARY MAGNETIC FIELD
PARTICLES AND FIELDS
INTERPLANETARY MAGNETIC FIELDS

PERSONNEL

PI - N.F.	NESS	NASA-GSFC
CI - R.P.	LEPPING	NASA-GSFC
CI - F.M.	NEUBAUER	U OF COLOGNE
CI - K.W.	BEHANNON	NASA-GSFC
CI - L.F.	BURLAGA	NASA-GSFC
CI - M.H.	ACUNA	NASA-GSFC

BRIEF DESCRIPTION
This experiment was designed to investigate (1) the magnetic fields of Jupiter, Saturn, Uranus, and Neptune and (2) the solar-wind interaction of the magnetospheres of these planets with the interplanetary magnetic field out to the solar-wind boundary with the interstellar magnetic field, and beyond, if crossed. The investigation was carried out using two high-field and two low-field triaxial fluxgate magnetometers. Data accuracy of the interplanetary fields was plus or minus 0.1 nT, and the range of measurements was from 0.01 nT to 2.E-3 T.

------- VOYAGER 2, SCARF---

INVESTIGATION NAME- PLASMA WAVE (.01-56 KHZ)

NSSDC ID- 77-076A-13 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY IONOSPHERES
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - F.L.	SCARF	TRW SYSTEMS GROUP
CI - D.A.	GURNETT	U OF IOWA

BRIEF DESCRIPTION
This investigation provided continuous, sheath-independent measurements of the electron density profiles at Jupiter and Saturn and will provide similar measurements for Uranus and Neptune. It also gave basic information on local wave-particle interactions required to carry out comparative studies of the physics of the magnetospheres of these planets. The instrumentation consisted of a 16-channel step frequency receiver and a low-frequency waveform receiver with associated electronics. The frequency range for this instrument was from 10 Hz to 56 kHz. This instrument shared the 10-m antennas developed for the planetary radio astronomy investigation.

------- VOYAGER 2, SMITH---

INVESTIGATION NAME- IMAGING

NSSDC ID- 77-076A-01 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
PLANETARY ATMOSPHERES
PLANETOLOGY

PERSONNEL

TL - B.A.	SMITH	U OF ARIZONA
OT - L.A.	SODERBLOM	US GEOLOGICAL SURVEY
TM - G.A.	BRIGGS	NASA HEADQUARTERS
TM - A.F.	COOK	SAO
TM - G.E.	DANIELSON	CALIF INST OF TECH
TM - M.E.	DAVIES	RAND CORP
TM - G.E.	HUNT	U COLLEGE LONDON
TM - T.	OWEN	STATE U OF NEW YORK
TM - C.	SAGAN	CORNELL U
TM - V.E.	SUOMI	U OF WISCONSIN
TM - T.V.	JOHNSON	NASA-JPL
TM - H.	MASURSKY	US GEOLOGICAL SURVEY

BRIEF DESCRIPTION
The photographic experiment used a two-camera system, based on the Mariner 10 system. This system included one narrow-angle, long-focal-length camera and one wide-angle, short-focal-length camera. The maximum resolution achievable depended greatly on the actual trajectory on this multi-encounter mission, but was as high as 0.5 to 1.0 km on the closest approaches to some objects. At Jupiter and Saturn, the resolution that was achieved was better than 20 km and 5 km, respectively. The objectives of the experiment were to photograph global motions and cloud distributions (on Jupiter, Saturn, Uranus, and Neptune), gross dynamical properties, zonal rotations, orientation of spin axes, zonal shear, vertical shear, flow instabilities, spots, and spectrum of scale of atmospheric motions in time and space. Additional objectives included the study of the mode of release of internal energy flux (search for convection cells and rolls), study of growth, dissipation, morphology, and vertical structure of cloud complexes, gross optical properties, global and localized scattering function in the visible spectrum, polarimetry, nature of chromophores (their structure and development), and high resolution of the Great Red Spot. The objectives of the satellite encounters included (1) gross characteristics (size, shape, rotation, spin axis, cartography, improved ephemerides and masses); (2) geology (major physiographic provinces, impact and volcanic features, lineaments, polar caps, erosion processes, and low- and high-density satellite comparative studies, detection of atmospheres, frosts, and limb stratification of aerosols); and (3) surface properties (colorimetry, scattering function, nature of brightness variation, and search for new satellites). Studies of Saturn's rings were carried out and will be for Uranus' rings. Objectives included (1) resolution of individual ring components of clumps of material; (2) vertical and radial distribution of material at very high resolution; (3) scattering function; (4) coarse polarimetry; (5) occultation - optical depth; and (6) distinguishing different types of material in the rings. Other objectives were to search for new comets, asteroids, and targets of opportunity.

------- VOYAGER 2, STONE---

INVESTIGATION NAME- HIGH- AND MODERATELY LOW-ENERGY
COSMIC-RAY TELESCOPE

NSSDC ID- 77-076A-08 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - E.C.	STONE	CALIF INST OF TECH
OI - R.E.	VOGT	CALIF INST OF TECH
CI - J.R.	JOKIPII	U OF ARIZONA
CI - F.B.	MCDONALD	NASA HEADQUARTERS
CI - J.H.	TRAINOR	NASA-GSFC
CI - W.R.	WEBBER	U OF NEW HAMPSHIRE
CI - A.W.	SCHARDT	NASA-GSFC

BRIEF DESCRIPTION
This investigation studied the origin and acceleration process, life history, and dynamic contribution of interstellar cosmic rays, the nucleosynthesis of elements in cosmic-ray sources, the behavior of cosmic rays in the interplanetary medium, and the trapped planetary energetic particle environment. The instrumentation included a High-Energy Telescope System (HETS) and a Low-Energy Telescope System (LETS). The HETS covered an energy range between 6 and 500 MeV/nucleon for nuclei ranging in atomic numbers from 1 through 30. In addition, electrons in the energy range between 3 and 100 MeV were measured by this telescope and an electron telescope. The LETS measured the energy and determined the identity of nuclei for energies between .15 and 30 MeV/nucleon and atomic numbers from 1 to 30. The instruments also measured the anisotropies of electrons and nuclei. In addition, electrons in the energy range between 3 and 100 MeV were measured by the electron telescope.

------- VOYAGER 2, TYLER---

INVESTIGATION NAME- RADIO SCIENCE TEAM

ORIGINAL PAGE IS
OF POOR QUALITY

CI - J.E. BLAMONT CNRS-SA
CI - J.L. BERTAUX CNRS-SA
CI - S.K. ATREYA U OF MICHIGAN
CI - B.R. SANDEL U OF SOUTHERN CALIF
CI - D.E. SHEMANSKY U OF SOUTHERN CALIF

BRIEF DESCRIPTION

The UV spectrometer was designed to measure atmospheric properties, and to measure radiation in the wavelength range from 0.04 to 0.16 micrometers (400 to 1600 A). Two modes of instrument operation were planned, airglow and occultation. In the airglow mode the atmospheric radiation was measured. This radiation is predominantly resonance-scattered solar radiation, where the scattering is by molecular or atomic atmospheric constituents such as hydrogen (1216 A) or helium (584 A). In the occultation mode, sunlight was reflected into the spectrometer, and the solar spectrum was recorded. As the atmosphere moved between the spacecraft and the sun, the absorption characteristics of the atmosphere were obtained over the measured wavelength region. The absorption spectrum was used to identify the absorber as well as to measure its abundance in the line of sight to the sun. In addition, the atmospheric thermal structure could be inferred.

------- VOYAGER 1, HANEL-------------------------------------

INVESTIGATION NAME- INFRARED SPECTROSCOPY AND RADIOMETRY

NSSDC ID- 77-084A-03 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL
PI - R.A. HANEL NASA-GSFC
CI - V.G. KUNDE NASA-GSFC
CI - D.P. CRUIKSHANK U OF HAWAII
CI - W.C. MAGUIRE NASA-GSFC
CI - J.C. PEARL NASA-GSFC
CI - J.A. PIRRAGLIA NASA-GSFC
CI - R.E. SAMUELSON NASA-GSFC
CI - P.J. GIERASCH CORNELL U
CI - C.A. PONNAMPERUMA U OF MARYLAND
CI - D. GAUTIER PARIS OBSERVATORY
CI - F.M. FLASAR NASA-GSFC
CI - S. KUMAR U OF SOUTHERN CALIF
CI - B.J. CONRATH NASA-GSFC

BRIEF DESCRIPTION

This investigation was carried out using a Michelson interferometer and a single-channel radiometer similar in design to the Mariner 9 IRIS, combined into a single instrument. The investigation studied both global and local energy balance. Atmospheric composition was also investigated, including determination of the H2/He ratio, and the abundance of CH2 and NH3. Vertical temperature profiles were obtained on the planets and satellites with atmospheres. Studies of the composition, thermal properties, and size of particles in Saturn's rings were conducted. The interferometer had a spectral range of approximately 180 to 2500 1/cm (4-55 micrometers), while the radiometer range covered the spectra from approximately 5000 to 30000 1/cm (0.33-2 micrometers). The nominal apodized spectral resolution of the interferometer was 4.3 1/cm. The instruments shared a half-meter Cassegrain telescope with a 0.25-deg field of view. The basic quantity measured was the spectral radiance of emitted and reflected IR radiation and a large fraction of reflected visible energy. The interferometer was calibrated using deep space (assumed to be a black body at 0 deg K) and the internal instrument temperature as reference points. The radiometer was calibrated with a diffuser plate of known radiometric properties. For a description of the instrument see Hanel, R. et al., 1977, Applied Optics, v. 19, p. 1391.

------- VOYAGER 1, KRIMIGIS----------------------------------

INVESTIGATION NAME- LOW-ENERGY CHARGED PARTICLE ANALYZER AND TELESCOPE

NSSDC ID- 77-084A-07 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - S.M. KRIMIGIS APPLIED PHYSICS LAB
CI - C.Y. FAN U OF ARIZONA
CI - G. GLOECKLER U OF MARYLAND
CI - L.J. LANZEROTTI BELL TELEPHONE LAB
CI - T.P. ARMSTRONG U OF KANSAS
CI - W.I. AXFORD VICTORIA U WELLINGTON
CI - C.O. BOSTROM APPLIED PHYSICS LAB
CI - E.P. KEATH APPLIED PHYSICS LAB

BRIEF DESCRIPTION

This experiment was designed to study energetic particles in both planetary and interplanetary environments. In the planetary mode, particle sensing occurred with six different solid-state, totally depleted, surface-barrier type detectors. Both coincidence and singles count data were available from two of the detectors. By looking out at a shallow angle from behind the sun shield, measurements were made in regions where particle fluxes were so high as to saturate low-energy detectors. A current mode option was also available for high flux environments. In the interplanetary mode the experiment was equipped with a particle telescope which had solid-state detectors ranging from 2-2450 micrometers in thickness. The telescope consisted of two multi-dE/dx x E systems placed back to back in order to use a common all solid-state active anticoincidence shield. The telescope allowed the identification of protons, alpha particles, and heavier nuclei (Z from 3 to 26) in the range from 0.05 to 30 MeV. The combined dynamic range of all the instruments extended from approximately 1.E-5 to greater than 1.E12 particles/(sq cm-s-sr). The energy range covered extended from approximately 10 keV to greater than 11 MeV for electrons and from approximately 15 keV to greater than or equal to 150 MeV for protons and heavier ions. A stepping motor rotated the array of detectors through eight discrete sectors in 45-deg increments, thus allowing a 360-deg scan. For a description of the experiment see Space Science Reviews, 1977, v. 21, pp. 329-354.

------- VOYAGER 1, NESS-------------------------------------

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETERS

NSSDC ID- 77-084A-05 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY MAGNETIC FIELD
PARTICLES AND FIELDS
INTERPLANETARY MAGNETIC FIELDS

PERSONNEL
PI - N.F. NESS NASA-GSFC
CI - M.H. ACUNA NASA-GSFC
CI - K.W. BEHANNON NASA-GSFC
CI - L.F. BURLAGA NASA-GSFC
CI - R.P. LEPPING NASA-GSFC
CI - F.M. NEUBAUER U OF COLOGNE

BRIEF DESCRIPTION

This experiment was designed to investigate the magnetic fields of Jupiter and Saturn, the solar-wind interaction with the magnetospheres of these planets, and the interplanetary magnetic field out to the solar wind boundary with the interstellar magnetic field and beyond, if crossed. The investigation was carried out using two high-field and two low-field triaxial fluxgate magnetometers. Data accuracy of the interplanetary fields was plus or minus 0.1 nT, and the range of measurements was from 0.01 nT to 2.E-3 T.

------- VOYAGER 1, SCARF------------------------------------

INVESTIGATION NAME- PLASMA WAVE (.01-56 KHZ)

NSSDC ID- 77-084A-13 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
PLANETARY IONOSPHERES

PERSONNEL
PI - F.L. SCARF TRW SYSTEMS GROUP
CI - D.A. GURNETT U OF IOWA

BRIEF DESCRIPTION

This investigation provided continuous, sheath-independent measurements of the electron-density profiles at Jupiter and Saturn. It also gave basic information on local wave-particle interaction required to carry out comparative studies of the physics of the Jupiter and Saturn magnetospheres. The instrumentation consisted of a 16-channel, step-frequency receiver and a low-frequency waveform receiver, with associated electronics. The frequency range for this instrument was from 10 Hz to 56 kHz. This instrument shared the 10-m antennas developed for the investigation of planetary radio astronomy.

------- VOYAGER 1, SMITH------------------------------------

INVESTIGATION NAME- IMAGING

NSSDC ID- 77-084A-01 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
PLANETARY ATMOSPHERES
PLANETOLOGY
ATMOSPHERIC PHYSICS

PERSONNEL

TL - B.A.	SMITH	U OF ARIZONA
DT - L.A.	SODERBLOM	US GEOLOGICAL SURVEY
TM - G.A.	BRIGGS	NASA HEADQUARTERS
TM - A.F.	COOK	SAO
TM - G.E.	DANIELSON	CALIF INST OF TECH
TM - M.E.	DAVIES	RAND CORP
TM - G.E.	HUNT	U COLLEGE LONDON
TM - T.	OWEN	STATE U OF NEW YORK
TM - C.	SAGAN	CORNELL U
TM - V.E.	SUOMI	U OF WISCONSIN
TM - T.V.	JOHNSON	NASA-JPL
TM - H.	MASURSKY	US GEOLOGICAL SURVEY

BRIEF DESCRIPTION

The photographic experiment used a two-camera system, based on the Mariner 10 system. This system included one narrow-angle, long-focal-length camera and one wide-angle, short-focal-length camera. The maximum resolution achievable depended on the actual trajectory on this multi-encounter mission, but the resolution was as high as 0.5 to 1.0 km on the closest approaches to some objects. At Jupiter and Saturn, the resolution was better than 20 km and 5 km, respectively. The objectives of the experiment were to photograph global motions and cloud distributions on Jupiter and Saturn, gross dynamical properties, zonal rotation, orientation of spin axis, zonal shear, vertical shear, flow instabilities, spots, and spectrum of scale of atmospheric motions in time and space. Additional objectives included the study of the mode of release of internal energy flux (search for convection cells and rolls), study of growth, dissipation, morphology, and vertical structure of cloud complexes, gross optical properties, global and localized scattering function in the visible spectrum, polarimetry, nature of chromophores (their structure and development), and high resolution of the Great Red Spot. The objectives of the satellite encounters included the following: (1) gross characteristics (size, shape, rotation, spin axis, cartography, improved ephemerides, and masses), (2) geology (major physiographic provinces, impact and volcanic features, lineaments, polar caps, erosion processes, low- and high-density satellite comparative studies, detection of atmospheres, frosts, and limb stratification of aerosols), and (3) surface properties (colorimetry, scattering function, nature of brightness variation, and search for new satellites). Studies of Saturn's rings included (1) resolution of individual ring components or clumps of material, (2) vertical and radial distribution of material at very high resolution, (3) scattering function, (4) coarse polarimetry, (5) occultation - optical depth, and (6) distinguishing different types of material in the rings. Other objectives were to search for new comets, asteroids, and targets of opportunity.

------- VOYAGER 1, STONE--

INVESTIGATION NAME- HIGH- AND MODERATELY LOW-ENERGY COSMIC-RAY TELESCOPE

NSSDC ID- 77-084A-08 INVESTIGATIVE PROGRAM CODE EL

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - E.C.	STONE	CALIF INST OF TECH
OI - R.E.	VOGT	CALIF INST OF TECH
CI - J.R.	JOKIPII	U OF ARIZONA
CI - F.B.	MCDONALD	NASA HEADQUARTERS
CI - J.H.	TRAINOR	NASA-GSFC
CI - W.R.	WEBBER	U OF NEW HAMPSHIRE
CI - A.W.	SCHARDT	NASA-GSFC

BRIEF DESCRIPTION

This investigation studied the origin and acceleration process, life history, and dynamic contribution of interstellar cosmic rays, the nucleosynthesis of elements in cosmic-ray sources, the behavior of cosmic rays in the interplanetary medium, and the trapped planetary energetic-particle environment. The instrumentation included a High-Energy Telescope System (HETS) and a Low-Energy Telescope System (LETS). The HETS covered an energy range between 6 and 500 MeV/nucleon for nuclei ranging in atomic numbers from 1 through 30. In addition, electrons in the energy range between 3 and 100 MeV/nucleon were measured by this telescope and an electron telescope. The LETS measured the energy and determined the identity of nuclei for energies between 0.15 and 30 MeV/nucleon and atomic numbers from 1 to 30. The instruments also measured the anisotropies of electrons and nuclei. In addition, electrons in the energy range between 3 and 100 MeV/nucleon were measured by an electron telescope.

------- VOYAGER 1, TYLER--

INVESTIGATION NAME- RADIO SCIENCE TEAM

NSSDC ID- 77-084A-02 INVESTIGATIVE PROGRAM CODE EL

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
CELESTIAL MECHANICS
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

TL - G.L.	TYLER	STANFORD U
TM - V.R.	ESHLEMAN	STANFORD U
TM - J.D.	ANDERSON	NASA-JPL
TM - T.A.	CROFT	SRI INTERNATIONAL
TM - G.F.	LINDAL	NASA-JPL
TM - G.S.	LEVY	NASA-JPL
TM - G.E.	WOOD	NASA-JPL

BRIEF DESCRIPTION

The Radio Science Team used the telecommunications system of the Voyager spacecraft to perform its studies. The system was a coherent S- and X-band downlink and an S-band uplink. The science objectives of the radio science investigation were (1) to determine the physical properties of planetary and satellite ionospheres and atmospheres by examining the propagation effects on a dual-frequency radio signal during immersion and emersion of spacecraft occultation by the subject body, (2) to determine planetary and satellite masses, gravity fields, and densities by precise tracking of a dual-frequency radio signal from the spacecraft during the encounter period, and (3) to determine the amount and size distribution of material in Saturn's rings and the ring dimensions by examining the propagation effects on a dual-frequency radio signal that passed through each ring in succession, and through the gap between the C ring and Saturn's surface.

------- VOYAGER 1, WARWICK--

INVESTIGATION NAME- PLANETARY RADIO ASTRONOMY

NSSDC ID- 77-084A-10 INVESTIGATIVE PROGRAM CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

PI - J.W.	WARWICK	U OF COLORADO
CI - J.K.	ALEXANDER, JR.	NASA-GSFC
CI - T.D.	CARR	U OF FLORIDA
CI - F.T.	HADDOCK	U OF MICHIGAN
CI - D.H.	STAELIN	MASS INST OF TECH
CI - A.	BOISCHOT	PARIS OBSERVATORY
CI - C.C.	HARVEY	PARIS OBSERVATORY
CI - Y.	LEBLANC	PARIS OBSERVATORY
CI - W.E.	BROWN, JR.	NASA-JPL
CI - S.	GULKIS	NASA-JPL
CI - R.J.	PHILLIPS	LUNAR + PLANETARY INST
CI - J.B.	PEARCE	RADIOPHYSICS, INC
CI - A.C.	RIDDLE	U OF COLORADO
CI - R.G.	PELTZER	MARTIN-MARIETTA AEROSP
CI - M.L.	KAISER	NASA-GSFC

BRIEF DESCRIPTION

This experiment consisted of a sweep-frequency radio receiver operating in both polarization states, between 20 kHz and 40.5 MHz. The signal was received by a pair of orthogonal 10-m monopole antennas. Study of the radio-emission signals from Jupiter and Saturn over this range of frequencies yielded data concerning the physics of magnetospheric plasma resonances and nonthermal radio emissions from these planetary regions.

**************************** VOYAGER 2 ************************

SPACECRAFT COMMON NAME- VOYAGER 2
ALTERNATE NAMES- MARINER JUPITER/SATURN B, OUTER PLANETS B
MARINER 77B, MJS 77B
10271

NSSDC ID- 77-076A

LAUNCH DATE- 08/20/77 WEIGHT- 700. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- TITAN

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- SATURN FLYBY

PERSONNEL

MG - R.	MILLS	NASA HEADQUARTERS
SC - W.A.	BRUNK(DECEASED)	NASA HEADQUARTERS
PM - R.P.	LAESER	NASA-JPL
PS - E.C.	STONE	CALIF INST OF TECH

BRIEF DESCRIPTION

The overall objectives of Voyager 2 were to conduct exploratory investigations of the planetary systems of Jupiter, Saturn, Uranus, and Neptune, and of the interplanetary medium. Primary emphasis was placed on comparative studies of these planetary systems by obtaining (1) measurements of the environment, atmosphere, and body characteristics of the planets and one or more of the satellites of each planet, (2) studies of the nature of the rings of Saturn and Uranus, and (3) exploration of the interplanetary (or interstellar) medium at increasing distances from the sun. These objectives were met using a variety of instruments and methods including imaging, a coherent S- and X-band RF receiver, an IR interferometer and radiometer, a UV spectrometer, fluxgate

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magnetometers, Faraday cups, a charged-particle analyzer, plasma detector, plasma-wave radio receiver, cosmic-ray telescopes, photopolarimeter, and a sweep-frequency radio receiver. Jupiter close encounter was achieved on July 9, 1979, and Saturn on August 5, 1981.

------- VOYAGER 2, BRIDGE-------------------------------------

INVESTIGATION NAME- PLASMA SPECTROMETERS

NSSDC ID- 77-076A-06

INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI - H.S.	BRIDGE	MASS INST OF TECH
CI - A.J.	LAZARUS	MASS INST OF TECH
CI - S.	OLBERT	MASS INST OF TECH
CI - J.W.	BELCHER	MASS INST OF TECH
CI - V.M.	VASYLIUNAS	MPI-AERONOMY
CI - L.F.	BURLAGA	NASA-GSFC
CI - C.K.	GOERTZ	U OF IOWA
CI - G.L.	SISCOE	U OF CALIF, LA
CI - A.J.	HUNDHAUSEN	NATL CTR FOR ATMOS RES
CI - R.E.	HARTLE	NASA-GSFC
CI - K.W.	OGILVIE	NASA-GSFC
CI - J.D.	SULLIVAN	MASS INST OF TECH
CI - J.D.	SCUDDER	NASA-GSFC

BRIEF DESCRIPTION

The plasma investigation made use of two Faraday-cup detectors, one pointed along the earth-spacecraft line and one at right angles to this line. The earth-pointing detector determined the macroscopic properties of the plasma ions, obtaining accurate values of their velocity, density, and pressure. Three sequential energy scans were employed with (delta E)/E equal to 29, 7.2, and 1.8%, allowing a coverage from subsonic to highly supersonic flow. The side-looking Faraday cup measured electrons in the energy range from 5 eV to 1 keV.

------- VOYAGER 2, BROADFOOT---------------------------------

INVESTIGATION NAME- ULTRAVIOLET SPECTROSCOPY

NSSDC ID- 77-076A-04

INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.L.	BROADFOOT	U OF SOUTHERN CALIF
CI - A.	DALGARNO	SAO
CI - J.C.	MCCONNELL	YORK U
CI - R.M.	GOODY	HARVARD U
CI - T.M.	DONAHUE	U OF MICHIGAN
CI - M.B.	MCELROY	HARVARD U
CI - M.J.S.	BELTON	KITT PEAK NATL OBS
CI - D.F.	STROBEL	US NAVAL RESEARCH LAB
CI - H.W.	MOOS	JOHNS HOPKINS U
CI - J.E.	BLAMONT	CNRS-SA
CI - J.L.	BERTAUX	CNRS-SA
CI - S.K.	ATREYA	U OF MICHIGAN
CI - B.R.	SANDEL	U OF SOUTHERN CALIF
CI - D.E.	SHEMANSKY	U OF SOUTHERN CALIF

BRIEF DESCRIPTION

The UV spectrometer was designed to measure atmospheric properties and measured radiation in the wavelength range 0.04 to 0.16 micrometer (400 to 1600 A). Two modes of instrument operation were planned: airglow and occultation. In the airglow mode, the atmospheric radiation was measured. This radiation is predominantly resonance-scattered solar radiation, where the scattering is by the molecular or atomic atmospheric constituents, such as hydrogen (1216 A) or helium (584 A). In the occultation mode, sunlight was reflected into the spectrometer, and the solar spectrum was recorded. As the atmosphere moved between the spacecraft and the sun, the absorption characteristics of the atmosphere were obtained over the measured wavelength region. The absorption spectrum was used to identify the absorber as well as to measure its abundance in the line of sight to the sun. In addition, the atmosphere's thermal structure could be inferred.

------- VOYAGER 2, HANEL-------------------------------------

INVESTIGATION NAME- INFRARED SPECTROSCOPY AND RADIOMETRY

NSSDC ID- 77-076A-03

INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL

PI - R.A.	HANEL	NASA-GSFC
CI - C.A.	PONNAMPERUMA	U OF MARYLAND
CI - P.J.	GIERASCH	CORNELL U
CI - J.A.	PIRRAGLIA	NASA-GSFC
CI - R.E.	SAMUELSON	NASA-GSFC
CI - W.C.	MAGUIRE	NASA-GSFC
CI - J.C.	PEARL	NASA-GSFC
CI - V.G.	KUNDE	NASA-GSFC
CI - D.P.	CRUIKSHANK	U OF HAWAII
CI - B.J.	CONRATH	NASA-GSFC
CI - D.	GAUTIER	PARIS OBSERVATORY
CI - F.M.	FLASAR	NASA-GSFC
CI - S.	KUMAR	U OF SOUTHERN CALIF

BRIEF DESCRIPTION

This investigation was carried out using a Michelson interferometer and a single-channel radiometer similar in design to the Mariner 9 IRIS, combined into a single instrument. The investigation studied both global and local energy balance. Atmospheric composition was also investigated, including determination of the H2/He ratio, and the abundance of CH2 and NH3. Vertical temperature profiles were obtained on the planets and satellites with atmospheres. Studies of the composition, thermal properties, and size of particles in Saturn's rings were conducted. The interferometer had a spectral range of approximately 180 to 2500 1/cm (4-55 micrometers), while the radiometer range covered the spectra from approximately 5000 to 30000 1/cm (0.33-2 micrometers). The nominal apodized spectral resolution of the interferometer was 4.3 1/cm. The instruments shared a half-meter Cassegrain telescope with a 0.25-deg field of view. The basic quantity measured was the spectral radiance of emitted and reflected IR radiation and a large fraction of reflected visible energy. The interferometer was calibrated using deep space (assumed to be a black body at 0 deg K) and the internal instrument temperature as reference points. The radiometer was calibrated with a diffuser plate of known radiometric properties. For a description of the instrument see Hanel, R. et al., 1977, Applied Optics, v. 19, p. 1391.

------- VOYAGER 2, KRIMIGIS----------------------------------

INVESTIGATION NAME- LOW-ENERGY CHARGED PARTICLE ANALYZER AND TELESCOPE

NSSDC ID- 77-076A-07

INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - S.M.	KRIMIGIS	APPLIED PHYSICS LAB
CI - C.O.	BOSTROM	APPLIED PHYSICS LAB
CI - T.P.	ARMSTRONG	U OF KANSAS
CI - W.I.	AXFORD	VICTORIA U WELLINGTON
CI - G.	GLOECKLER	U OF MARYLAND
CI - L.J.	LANZEROTTI	BELL TELEPHONE LAB
CI - C.Y.	FAN	U OF ARIZONA
CI - E.P.	KEATH	APPLIED PHYSICS LAB

BRIEF DESCRIPTION

This experiment was designed to study energetic particles in both planetary and interplanetary environments. In the planetary mode, particle sensing occurred with six different solid-state, totally depleted, surface-barrier type detectors. Both coincidence and singles count data were available from two of the detectors. By looking out at a shallow angle from behind the sun shield, measurements were made in regions where particle fluxes were so high as to saturate low-energy detectors. A current mode option was also available for high flux environments. In the interplanetary mode the experiment was equipped with a particle telescope which had solid-state detectors ranging from 2 - 2450 micrometers in thickness. The telescope consisted of two multi-dE/dx x E systems placed back to back in order to use a common all solid-state active anticoincidence shield. The telescope allowed the identification of protons, alpha particles, and heavier nuclei (Z from 3 to 26) in the range from 0.05 to 30 MeV. The combined dynamic range of all the instruments extended from approximately 1.E-5 to greater than 1.E12 particles/(sq cm-s-sr). The energy range covered extended from approximately 10 keV to greater than 11 MeV for electrons and from approximately 15 keV to greater than or equal to 150 MeV for protons and heavier ions. A stepping motor rotated the array of detectors through eight discrete sectors in 45-deg increments, thus allowing a 360-deg scan. For a description of the experiment see Space Science Reviews, 1977, v. 21, pp. 329-354.

------- VOYAGER 2, LANE--------------------------------------

INVESTIGATION NAME- MULTIFILTER PHOTOPOLARIMETER, 2200-7300 A

NSSDC ID- 77-076A-02 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
CELESTIAL MECHANICS
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

TL - G.L.	TYLER	STANFORD U
TM - G.F.	LINDAL	NASA-JPL
TM - G.S.	LEVY	NASA-JPL
TM - T.A.	CROFT	SRI INTERNATIONAL
TM - V.R.	ESHLEMAN	STANFORD U
TM - J.D.	ANDERSON	NASA-JPL
TM - G.E.	WOOD	NASA-JPL

BRIEF DESCRIPTION

The Radio Science Team used the telecommunications systems of the Voyager spacecraft to perform their studies. The system was a coherent S- and X-band downlink and S-band uplink. The science objectives of the radio science investigation were (1) to determine the physical properties of planetary and satellite ionospheres and atmospheres by examining the propagation effects on a dual-frequency radio signal during immersion of spacecraft occultation by the subject body, (2) to determine planetary and satellite masses, gravity fields and densities by precise tracking of a dual-frequency radio signal from the spacecraft during the encounter period, and (3) to determine the amount and size distributions of material in the rings of Saturn and the ring dimensions by examining the propagation effects on a dual-frequency radio signal that passes through each ring in succession and through the gap between the C ring and the surface of Saturn.

------- VOYAGER 2, WARWICK------------------------------------

INVESTIGATION NAME- PLANETARY RADIO ASTRONOMY

NSSDC ID- 77-076A-10 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

PI - J.W.	WARWICK	U OF COLORADO
CI - W.E.	BROWN, JR.	NASA-JPL
S.	GULKIS	NASA-JPL
[illegible]C.	HARVEY	PARIS OBSERVATORY
[illegible] - Y.	LEBLANC	PARIS OBSERVATORY
CI - D.H.	STAELIN	MASS INST OF TECH
CI - A.	BOISCHOT	PARIS OBSERVATORY
CI - T.D.	CARR	U OF FLORIDA
CI - F.T.	HADDOCK	U OF MICHIGAN
CI - J.K.	ALEXANDER, JR.	NASA-GSFC
CI - R.J.	PHILLIPS	LUNAR + PLANETARY INST
CI - R.G.	PELTZER	MARTIN-MARIETTA AEROSP
CI - J.B.	PEARCE	RADIOPHYSICS, INC
CI - A.C.	RIDDLE	U OF COLORADO
CI - M.L.	KAISER	NASA-GSFC

BRIEF DESCRIPTION

This experiment consisted of a sweep-frequency radio receiver operating in both polarization states, between 20 kHz and 40.5 MHz. The signal was received by a pair of orthogonal 10-m monopole antennas. The physics of magnetospheric plasma resonances and of nonthermal radio emissions from these planetary regions was studied by investigation of the radio emission signals from Jupiter and Saturn over this range of frequencies, and similar studies will be done at Uranus and Neptune.

3

DESCRIPTIONS OF PLANNED SPACECRAFT AND EXPERIMENTS

3. DESCRIPTIONS OF PLANNED SPACECRAFT AND EXPERIMENTS

This section contains descriptions of scientific spacecraft (including both free-flying spacecraft and Shuttle-attached payloads) and experiments pertinent to this report that were approved or in the planning stage as of September 30, 1984 or later, that had progressed beyond the experiment or investigation selection stage, and for which NSSDC has at least minimal documentation. The descriptions are sorted first by spacecraft common name. Within each spacecraft listing, experiments are ordered by the last name of the principal investigator, lead investigator, or team leader. If the common name, as used by NSSDC, is not known, the reader should refer to an alternate common name listed in the "Index of Active and Planned Spacecraft and Experiments" (Section 4) to obtain the cross reference to the NSSDC common name. In order to avoid excessive duplication, "series" missions which consist of several identical or similar payloads are indicated with an "X" after the series name, and are described in a generic manner in this section. Some additional information about the separate payloads in these "series" missions may be found in tables adjacent to these descriptions.

Each spacecraft or experiment entry in this section is composed of two parts, a heading and a brief description. Each heading lists (1) specific parameters and characteristics of the spacecraft and experiments and (2) spacecraft and experiment personnel along with their affiliations. Definitions of some of the parameters found in these headings are given in Appendix C.

3.1 Contents of Spacecraft Entries

The heading for each spacecraft description in this section includes a set of planned initial orbit parameters: orbit type, orbit period, apoapsis, periapsis, and inclination for the spacecraft orbit. No orbit parameters are listed for lander, flyby, or probe missions. In addition, the heading contains the spacecraft or Shuttle-attached payload weight, launch date (as provided by the project office; actual date may change), launch site, vehicle, common and alternate names, NSSDC ID code, sponsoring country and agency, spacecraft personnel and personnel codes and affiliations. The personnel codes used are as follows:

CO (general contact)
MG (program manager)
MM (mission manager)
MO (mission operations manager)
MS (mission scientist)
PC (project coordinator)
PD (project director)
PE (project engineer)
PM (project manager)
PS (project scientist)
SC (program scientist)
TD (technical director)

This terminology is standard for NASA missions; the equivalent functions for missions of other countries or agencies have been given the same position names.

The spacecraft brief description is immediately below each heading.

3.2 Contents of Experiment Entries

Each experiment entry heading includes the experiment name, the NSSDC ID code, the investigative program, the investigation discipline, and the names, titles, and affiliation or locations of the investigators associated with the experiment. The experiment brief description is immediately below each experiment entry heading.

The common titles for experiment investigators used in this report include the following:

PI (principal investigator)
LI (lead investigator)
TL (team leader)
CI (co-investigator)
OI (other investigator)
TM (team members)

Other investigator titles such as deputy team leader (DT), experiment manager (EM), experiment scientist (ES), or general contact (CO) may also be used.

Each experiment is assigned an investigative program category. For NASA-sponsored investigations these program categories include one of the following NASA Headquarters division codes:

CODE EB (Life Sciences)
CODE EC (Communications)
CODE EE (Earth & Science Applications)
CODE EL (Solar System Exploration)
CODE EN (Materials Processing)
CODE EZ (Astrophysics)
CODE RS (Space Systems)

The addition of "/CO-OP" to any code indicates a cooperative effort between NASA and another agency.

3.3 Planned Spacecraft and Experiment Descriptions

A spacecraft may be included in the planned section of this report if it is either an approved or a proposed mission (as of September 30, 1984 or later), if the experiments or investigations have already been selected, and if NSSDC has at least minimal documentation.

************************** AFP-675 **************************

SPACECRAFT COMMON NAME- AFP-675
ALTERNATE NAMES- AIR FORCE PROJECT-675, CIRRIS 1A
STP P-675

NSSDC ID- AFP-675

LAUNCH DATE- WEIGHT- 5080. KG
LAUNCH SITE-
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- MIN INCLINATION- DEG
PERIAPSIS- 300. KM ALT APOAPSIS- 300. KM ALT

PERSONNEL

MM - J.	JANZEN	USAF SPACE DIVISION
PM - P.	SEFCHEK	USAF SPACE DIVISION
PM - H.	SHODISS	LOCKHEED PALO ALTO

BRIEF DESCRIPTION
This Shuttle payload contains six experiments mounted in an Experiment Support System (ESS). The ESS consists of a pallet plus a command panel. The objectives of AFP-675 are (1) to obtain data in several wavelength regions to support the development of DOD systems, (2) to validate technologies for DOD applications, (3) to validate the use of man as an autonomous experimenter in space, and (4) to demonstrate the cost effectiveness of performing DOD experiments on reusable systems. Payload specialists will conduct the six experiments that have been assigned to this flight. The experiments cover the infrared, ultraviolet, X-ray and gamma-ray portions of the spectrum, as well as particle measurements.

------- AFP-675, CARRUTHERS -------

INVESTIGATION NAME- FAR ULTRAVIOLET CAMERAS

NSSDC ID- AFP-675-02 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
ASTRONOMY

PERSONNEL

PI - G.R.	CARRUTHERS	US NAVAL RESEARCH LAB
OI - R.W.	KREPLIN	US NAVAL RESEARCH LAB

BRIEF DESCRIPTION
The primary objectives of this investigation are to perform imagery and photometry of naturally occurring and man-made emission phenomena in near-earth space in the 1050 to 1600 A and 1230 to 2000 A wavelength ranges. The phenomena of primary interest include day and night airglow, diffuse aurora, and the Shuttle environment. Other objectives are to perform observations of interplanetary and interstellar media, stars, extragalactic objects, comets, and effects of chemical deposition; and to make atmospheric density measurements by stellar occultations. This survey instrument consists of two imaging cameras and a low-light-level TV camera, all co-aligned on a two-axis gimbal platform. The instrument is controlled from the aft flight deck of the Shuttle by payload specialists.

------- AFP-675, FENIMORE -------

INVESTIGATION NAME- UNIFORMLY REDUNDANT ARRAY

NSSDC ID- AFP-675-03 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY
TECHNOLOGY

PERSONNEL

PI - E.	FENIMORE	LOS ALAMOS NAT LAB
OI - W.	KU	COLUMBIA U
OI - R.E.	SPALDING	SANDIA LABORATORIES
CI - W.	PRIEDHORSKY	LOS ALAMOS NAT LAB
CI - D.	ROUSSEL-DUPRE	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
The objectives of this investigation are (1) to demonstrate coded aperture imaging technology in a space environment; (2) to conduct studies of astrophysical sources of interest; (3) to develop the capability to form images without pointing stabilization, but with pointing knowledge; and (4) to develop the capability to refine images using photographically measured torsional flexure along the internal instrument axis. The instrument is a wide field-of-view (5 deg), photon-counting, 2 to 70 keV imaging device that employs a coded aperture imaging technique and an imaging gas scintillator, position-sensitive proportional counter as a detector. The instrument is pointed at objects of interest by using the Shuttle.

------- AFP-675, LEBLANC -------

INVESTIGATION NAME- HORIZON ULTRAVIOLET PROGRAM

NSSDC ID- AFP-675-05 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY
ATMOSPHERIC PHYSICS

PERSONNEL

PI - F.	LEBLANC	USAF GEOPHYS LAB
OI - R.E.	HUFFMAN	USAF GEOPHYS LAB

BRIEF DESCRIPTION
The objectives of this investigation are to demonstrate the capability to measure the spatial and spectral characteristics of the earth's horizon as observed in the vacuum ultraviolet wavelength region. A secondary objective is to analyze Shuttle contamination. The atmospheric radiance will be measured as a function of tangent altitude. The flight sensor consists of an Ebert-Fastie spectrometer telescope assembly which is pivoted about an axis through an angular range of 20 deg. The sensor covers a wavelength range of 1100 to 1900 A.

------- AFP-675, O'NEIL -------

INVESTIGATION NAME- CRYOGENIC INFRARED RADIANCE
INSTRUMENTATION FOR SHUTTLE

NSSDC ID- AFP-675-01 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
UPPER ATMOSPHERE RESEARCH
ATMOSPHERIC PHYSICS

PERSONNEL

PI - R.R.	O'NEIL	USAF GEOPHYS LAB
OI - M.	AHMADJIAN	USAF GEOPHYS LAB
OI - R.	HUPPI	USAF GEOPHYS LAB
OI - B.	BARTSCHI	UTAH STATE U
OI - R.	HEGBLOM	BOSTON COLLEGE
CI - R.	NADILE	USAF GEOPHYS LAB
CI - D.A.	BURT	UTAH STATE U

BRIEF DESCRIPTION
The objectives of the CIRRIS 1A experiment are to measure the spectral, spatial, and temporal properties of the earth's limb from 30 to 300 km. The spectral range of interest is from 2.5 to 25 micrometers. The spatial measurement objective is to determine variations within the 30- to 300-km tangent height range with a resolution of 1 to 2 km. Of particular interest are latitudinal, auroral, day/night, terminator, airglow and geomagnetic variations. Secondary objectives include targets of opportunity, contamination measurement, technology verification, and man-in-space evaluation. The primary infrared sensors within this instrument are a high-resolution Michelson spatial interferometer and an extremely sensitive spatial radiometer. These sensors share the common collecting optics of a single, high off-axis rejection, cryogenically cooled telescope. The instrument is mounted on a two-axis gimbal, which is joystick-controlled from the aft flight deck by the payload specialist.

------- AFP-675, RESTER -------

INVESTIGATION NAME- GAMMA RAY ADVANCED DETECTOR

NSSDC ID- AFP-675-04 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY
TECHNOLOGY

PERSONNEL

PI - C.	RESTER	U OF FLORIDA
OI - P.	HASKINS	U OF FLORIDA
OI - H.	MOFFETT	U OF FLORIDA
CI - B.	PIERCEY	U OF FLORIDA

BRIEF DESCRIPTION
The objectives of this investigation are (1) to test the suitability of bismuth germanate as a gamma-ray detector scintillation material for use in space applications; (2) to test the suitability of n-type, high-purity germanium gamma-ray detectors for use in space; (3) to study the performance of an advanced gamma-ray spectrometer consisting of an n-type germanium central element with bismuth germanate active shielding; (4) to study the gamma-ray background due to the interaction of cosmic rays and solar particles with the Shuttle; and (5) to measure the gamma-ray spectrum of the sun and the galactic center. The spectrometer consists of an n-type, high-purity germanium detector mounted inside an annular shield of bismuth germanate scintillator. The detector is operated in a liquid nitrogen cryostat. The instrument is pointed by using the Shuttle.

BRIEF DESCRIPTION
The Galileo mission consists of a Jupiter orbiter and a

determine their librations; (4) to map the surface morphology of the Galilean satellites at a spatial resolution better than

INVESTIGATION NAME- QUADRUPOLE ION NEUTRAL MASS SPECTROGRAPH

NSSDC ID- AFP-675-06 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
IONOSPHERES

PERSONNEL
PI - E. TRZCINSKI USAF GEOPHYS LAB
OI - D. HUNTON USAF GEOPHYS LAB

BRIEF DESCRIPTION
The primary objective of this investigation is to support the CIRRIS 1A experiment by providing positive ion and neutral contaminant species identifications, concentrations, and temporal variabilities. Secondary objectives include (1) the acquisition of high spatial resolution ion measurements in the high-altitude auroral region, in the polar cusps, and in the polar cap regions in order to study the natural disturbances which produce ionospheric irregularities and amplitude and phase scintillations; (2) a test of plasma theory proposed to explain Shuttle glow by measurements of ion beams in the 10 to 100 eV range; (3) the acquisition of detailed neutral/ion measurements of thruster burns to define plume phenomenology, and of water dumps and other venting events to define the plasma/neutral environment modulations; (4) the acquisition of vehicle potential measurements, especially at polar latitudes, to examine spacecraft charging effects; and (5) the acquisition of atmospheric neutral composition data at high latitudes. The sensor package contains an electron impact ion source, an ion-focusing grid system, a set of quadrupole rods, and an electron multiplier. Measurements will be made by pointing the instrument in the direction of the orbital velocity.

*************************** AFP-888 ***************************

SPACECRAFT COMMON NAME- AFP-888
ALTERNATE NAMES- AIR FORCE PROJECT-888, SPACE TEST PROGRAM P80-1
P80-1, STP P80-1
TEAL RUBY SATELLITE(TRS)

NSSDC ID- AFP-888

LAUNCH DATE- WEIGHT- 1940. KG
LAUNCH SITE-
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 99.6 MIN INCLINATION- 72.5 DEG
PERIAPSIS- 740.8 KM ALT APOAPSIS- 740.8 KM ALT

PERSONNEL
PM - W.A. WISDOM USAF SPACE DIVISION
PS - I. RZEPNICK AEROSPACE CORP

BRIEF DESCRIPTION
Air Force Program-888 (APF-888) is a DOD satellite which has essentially a rectangular parallelepiped shape and approximate dimensions 2.4 x 2.4 x 0.7 m. The spacecraft is three-axis stabilized to maintain one 2.4- x 2.4-m surface vector pointing at the nadir. The spacecraft serves as a stable platform reference for three experiment telescopes. The spacecraft telemetry capability is PCM and it uses onboard tape recorders with up to 6 hours storage. This spacecraft was named STP P80-1 until December 1983 when it was renamed AFP-888 and its launch date became classified.

------- AFP-888, BOWYER ---------------------------------------

INVESTIGATION NAME- EXTREME ULTRAVIOLET PHOTOMETER

NSSDC ID- AFP-888-03 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
EARTH RESOURCES SURVEY
ASTRONOMY

PERSONNEL
PI - C.S. BOWYER U OF CALIF, BERKELEY
OI - D. FINLEY U OF CALIF, BERKELEY

BRIEF DESCRIPTION
The extreme-ultraviolet photometer investigation consists of an imaging grazing-incidence telescope with several broadband filters sensitive to extreme and far UV radiation. The telescope is zenith-looking. The orbital motion of the spacecraft provides a scanning function, resulting in a mapping of the sky in the wavelength regions of interest throughout the mission.

INVESTIGATION NAME- ION AUXILIARY PROPULSION SYSTEM

NSSDC ID- AFP-888-02 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J.L. POWER NASA-LERC

BRIEF DESCRIPTION
The ion auxiliary propulsion system will test two mercury ion thrusters, each producing 4.5 mN of thrust. These are configured on the spacecraft to be representative of the thruster's use for stationkeeping and maneuvering. Instrumentation provides thruster performance and measures the effects of the thrusters on other spacecraft components and functions.

------- AFP-888, QUELLE ---------------------------------------

INVESTIGATION NAME- STELLAR HORIZON ATMOSPHERIC DISPERSION
EXPERIMENT

NSSDC ID- AFP-888-04 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
NAVIGATION

PERSONNEL
PI - F. QUELLE UNKNOWN

BRIEF DESCRIPTION
The Stellar Horizon Atmospheric Dispersion (SHAD) experiment is designed to demonstrate the technology for autonomous satellite navigation and provide data on air densities and temperatures in the stratosphere. Its telescope is designed to lock on to bright stars about to sink into the outer limb of the earth's atmosphere and measure the atmospherically induced stellar refraction. Using that information, the software is designed to attempt to determine the S/C position. A secondary objective is to acquire upper atmosphere density profiles on a global basis.

------- AFP-888, STEARS ---------------------------------------

INVESTIGATION NAME- TEAL RUBY

NSSDC ID- AFP-888-01 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL
PI - H. STEARS DARPA

BRIEF DESCRIPTION
This investigation uses an IR telescope and detection system which has a multispectral mosaic focal plane to measure signal strength in a variety of spectral bands in the infrared. It gathers earth background data and tests techniques for IR detection and data reduction.

*************************** ASTRO-C ***************************

SPACECRAFT COMMON NAME- ASTRO-C
ALTERNATE NAMES-

NSSDC ID- ASTRO-C

LAUNCH DATE- 00/00/87 WEIGHT- 400. KG
LAUNCH SITE- KAGOSHIMA SPACE CENTER, JAPAN
LAUNCH VEHICLE- M-3S2-3

SPONSORING COUNTRY/AGENCY
JAPAN ISAS

PERSONNEL
PM - F. MAKINO ISAS
PS - S. MIYAMOTO OSAKA CITY U

BRIEF DESCRIPTION
This spacecraft houses the following three X-ray astronomy experiments: (1) a large area proportional counter array, (2) an all-sky monitor, and (3) a gamma-ray burst detector. The S/C provides a three-axis stabilized platform. The whole system weighs about 400 kg and is scheduled to be launched in 1987. The primary mission objective is the study of the time variability of X-rays from active galaxies such as Seyfert galaxies, BL Lac objects, and quasars. Accurate timing analysis of galactic X-ray sources is also planned.

INVESTIGATION NAME- QUADRUPOLE ION NEUTRAL MASS SPECTROGRAPH

NSSDC ID- AFP-675-06 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
IONOSPHERES

PERSONNEL
PI - E. TRZCINSKI USAF GEOPHYS LAB
OI - D. HUNTON USAF GEOPHYS LAB

BRIEF DESCRIPTION
The primary objective of this investigation is to support the CIRRIS 1A experiment by providing positive ion and neutral contaminant species identifications, concentrations, and temporal variabilities. Secondary objectives include (1) the acquisition of high spatial resolution ion measurements in the high-altitude auroral region, in the polar cusps, and in the polar cap regions in order to study the natural disturbances which produce ionospheric irregularities and amplitude and phase scintillations; (2) a test of plasma theory proposed to explain Shuttle glow by measurements of ion beams in the 10 to 100 eV range; (3) the acquisition of detailed neutral/ion measurements of thruster burns to define plume phenomenology, and of water dumps and other venting events to define the plasma/neutral environment modulations; (4) the acquisition of vehicle potential measurements, especially at polar latitudes, to examine spacecraft charging effects; and (5) the acquisition of atmospheric neutral composition data at high latitudes. The sensor package contains an electron impact ion source, an ion-focusing grid system, a set of quadrupole rods, and an electron multiplier. Measurements will be made by pointing the instrument in the direction of the orbital velocity.

**************************** AFP-888 ****************************

SPACECRAFT COMMON NAME- AFP-888
ALTERNATE NAMES- AIR FORCE PROJECT-888, SPACE TEST PROGRAM P80-1
P80-1, STP P80-1
TEAL RUBY SATELLITE(TRS)

NSSDC ID- AFP-888

LAUNCH DATE- WEIGHT- 1940. KG
LAUNCH SITE-
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 99.6 MIN INCLINATION- 72.5 DEG
PERIAPSIS- 740.8 KM ALT APOAPSIS- 740.8 KM ALT

PERSONNEL
PM - W.A. WISDOM USAF SPACE DIVISION
PS - I. RZEPNICK AEROSPACE CORP

BRIEF DESCRIPTION
Air Force Program-888 (APF-888) is a DOD satellite which has essentially a rectangular parallelepiped shape and approximate dimensions 2.4 x 2.4 x 0.7 m. The spacecraft is three-axis stabilized to maintain one 2.4- x 2.4-m surface vector pointing at the nadir. The spacecraft serves as a stable platform reference for three experiment telescopes. The spacecraft telemetry capability is PCM and it uses onboard tape recorders with up to 6 hours storage. This spacecraft was named STP P80-1 until December 1983 when it was renamed AFP-888 and its launch date became classified.

------- AFP-888, BOWYER---

INVESTIGATION NAME- EXTREME ULTRAVIOLET PHOTOMETER

NSSDC ID- AFP-888-03 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
EARTH RESOURCES SURVEY
ASTRONOMY

PERSONNEL
PI - C.S. BOWYER U OF CALIF, BERKELEY
OI - D. FINLEY U OF CALIF, BERKELEY

BRIEF DESCRIPTION
The extreme-ultraviolet photometer investigation consists of an imaging grazing-incidence telescope with several broadband filters sensitive to extreme and far UV radiation. The telescope is zenith-looking. The orbital motion of the spacecraft provides a scanning function, resulting in a mapping of the sky in the wavelength regions of interest throughout the mission.

INVESTIGATION NAME- ION AUXILIARY PROPULSION SYSTEM

NSSDC ID- AFP-888-02 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J.L. POWER NASA-LERC

BRIEF DESCRIPTION
The ion auxiliary propulsion system will test two mercury ion thrusters, each producing 4.5 mN of thrust. These are configured on the spacecraft to be representative of the thruster's use for stationkeeping and maneuvering. Instrumentation provides thruster performance and measures the effects of the thrusters on other spacecraft components and functions.

------- AFP-888, QUELLE---

INVESTIGATION NAME- STELLAR HORIZON ATMOSPHERIC DISPERSION
EXPERIMENT

NSSDC ID- AFP-888-04 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
NAVIGATION

PERSONNEL
PI - F. QUELLE UNKNOWN

BRIEF DESCRIPTION
The Stellar Horizon Atmospheric Dispersion (SHAD) experiment is designed to demonstrate the technology for autonomous satellite navigation and provide data on air densities and temperatures in the stratosphere. Its telescope is designed to lock on to bright stars about to sink into the outer limb of the earth's atmosphere and measure the atmospherically induced stellar refraction. Using that information, the software is designed to attempt to determine the S/C position. A secondary objective is to acquire upper atmosphere density profiles on a global basis.

------- AFP-888, STEARS---

INVESTIGATION NAME- TEAL RUBY

NSSDC ID- AFP-888-01 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL
PI - H. STEARS DARPA

BRIEF DESCRIPTION
This investigation uses an IR telescope and detection system which has a multispectral mosaic focal plane to measure signal strength in a variety of spectral bands in the infrared. It gathers earth background data and tests techniques for IR detection and data reduction.

**************************** ASTRO-C ****************************

SPACECRAFT COMMON NAME- ASTRO-C
ALTERNATE NAMES-

NSSDC ID- ASTRO-C

LAUNCH DATE- 00/00/87 WEIGHT- 400. KG
LAUNCH SITE- KAGOSHIMA SPACE CENTER, JAPAN
LAUNCH VEHICLE- M-3S2-3

SPONSORING COUNTRY/AGENCY
JAPAN ISAS

PERSONNEL
PM - F. MAKINO ISAS
PS - S. MIYAMOTO OSAKA CITY U

BRIEF DESCRIPTION
This spacecraft houses the following three X-ray astronomy experiments: (1) a large area proportional counter array, (2) an all-sky monitor, and (3) a gamma-ray burst detector. The S/C provides a three-axis stabilized platform. The whole system weighs about 400 kg and is scheduled to be launched in 1987. The primary mission objective is the study of the time variability of X-rays from active galaxies such as Seyfert galaxies, BL Lac objects, and quasars. Accurate timing analysis of galactic X-ray sources is also planned.

photon-counting microchannel plate detector. The HUT detector uses a MCP intensifier with a CsI photocathode, fiber-optically coupled to a Reticon self-scanned linear photodiode array with 1024 diodes. The aperture wheel assembly, which has eight positions, is used both as a seal for the evacuated spectrograph and as a means of changing the entrance aperture of the spectrograph. Visible light that does not enter the slit is reflected through a transfer lens onto an SIT vidicon camera. For point sources, a 6-arc-s diameter aperture is normally used; apertures as large as 2 arc-min are used on extended sources. A far-UV spectrum of a 14th magnitude star can be obtained in 20 min.

------- ASTRO-X, STECHER---

INVESTIGATION NAME- ULTRAVIOLET IMAGING TELESCOPE (UIT)

NSSDC ID- ASTRO -03 INVESTIGATIVE PROGRAM CODE EZ

INVESTIGATION DISCIPLINE(S)
HIGH ENERGY ASTROPHYSICS
ASTRONOMY

PERSONNEL

PI - T.P.	STECHER	NASA-GSFC
OI - R.C.	BOHLIN	SPACE TELESCOPE SCI IN
OI - A.M.	SMITH	NASA-GSFC
OI - M.S.	ROBERTS	NATL RADIO ASTRON OBS
OI - H.R.	BUTCHER	U OF GRONINGEN
OI - R.W.	O'CONNELL	U OF VIRGINIA

BRIEF DESCRIPTION

The objectives of the Ultraviolet Imaging Telescope (UIT) are to obtain images of faint objects in broad ultraviolet bands in the wavelength range 1200 to 3200 A. These images will be used to investigate the present stellar content and history of star formation in galaxies, the nature of spiral structure, and non-thermal sources in galaxies. Specific extragalactic problems to be addressed are the initial mass function for star formation, advanced stellar evolution in nearby galaxies, the nature of dust, extragalactic globular clusters, and integrated ultraviolet colors of nearby galaxies. Globular cluster evolution can be investigated from observations of the stellar content which will reach down to include the white dwarfs. In our own galaxy, there is a variety of interesting targets that can be better understood with ultraviolet imagery. Included in this category are supernovae remnants, reflection nebulae, dark nebulae, and planetary nebulae. In the solar system, the planets, their satellites, and comets are studied. The UIT is a 38-cm, f/9, Ritchey-Cretien telescope with 1.8 arc-s resolution and a 40 arc-min field of view. The dimensions are 80 x 80 x 333 cm, the mass is 400 kg, and 100 W of power are required. The detectors are magnetically focused two-stage image intensifiers, which have phosphor outputs that are coupled to 70-mm film transports through fiber optics. Two cathodes, CsI and CsTe, will be used in combination with six filters for each cathode to accurately define bandpass. There is also a transmission grating, which can be used for low dispersion objective spectra. The telescope will obtain images of very faint objects in the ultraviolet that are similar in angular resolution to that obtainable in the visible wavelength from the ground.

************************** COBE******************************

SPACECRAFT COMMON NAME- COBE
ALTERNATE NAMES- COSMIC BACKGROUND EXPL

NSSDC ID- COBE

LAUNCH DATE- 12/00/87 WEIGHT- 4500. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 103. MIN INCLINATION- 99. DEG
PERIAPSIS- 900. KM ALT APOAPSIS- 900. KM ALT

PERSONNEL

MG - D.	WRUBLIK	NASA HEADQUARTERS
SC - N.W.	BOGGESS	NASA HEADQUARTERS
PM - R.A.	MATTSON	NASA-GSFC
PS - J.C.	MATHER	NASA-GSFC

BRIEF DESCRIPTION

The purpose of the Cosmic Background Explorer (COBE) mission is to take precise measurements of the diffuse radiation between 1 micrometer and 10 mm over the whole celestial sphere. The following quantities are measured: (1) the spectrum of the 3 deg K radiation over the range 0.1 to 10 mm, (2) the isotropy of this radiation from 3.3 to 10 mm, and (3) the spectrum and angular distribution of diffuse infrared background radiation at wavelengths from 1 to 300 micrometers. The spacecraft consists of a base module to which an experiment module is attached. The experiment module contains a liquid-He Dewar filled with 87 kg of 1.6 deg K superfluid, with a conical sun shade/ground plane. The two modules rotate at 1 rpm about the axis of symmetry; the orientation of the 1-rpm spin axis is maintained anti-earth and at 94 deg to the sun-earth line. The spacecraft is a cylindrical 12-sided polyhedron that has solar panels on each side to supply an orbit-averaged power of 600 W. The communications and data handling system provides for control of all spacecraft and experiment functions. A NASA standard TDRSS transponder is used for command, telemetry, and tracking. Transmission of data is through an S-band phased-array antenna, either in real time or from a tape recorder. The spacecraft also houses a propulsion system that boosts it from its 300-km altitude Shuttle parking orbit to the 900-km operational altitude. The operational orbit is dawn-dusk sun-synchronous so that the sun is always to the side and can be shielded from the instruments. With this orbit and the spin-axis orientation, the instruments perform a complete scan of the celestial sphere every 6 months. The spin and symmetrical configuration eliminate local thermal effects that could bias the data. Low-conductance supports and multilayered insulation are used to decouple the spacecraft and experiment modules.

------- COBE, HAUSER---

INVESTIGATION NAME- DIFFUSE INFRARED BACKGROUND EXPERIMENT (DIRBE)

NSSDC ID- COBE -02 INVESTIGATIVE PROGRAM CODE EZ

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - M.G.	HAUSER	NASA-GSFC
OI - J.C.	MATHER	NASA-GSFC
OI - D.T.	WILKINSON	PRINCETON U
OI - S.	GULKIS	NASA-JPL
OI - R.	WEISS	MASS INST OF TECH
OI - G.F.	SMOOT	LAWRENCE BERKELEY LAB

BRIEF DESCRIPTION

The diffuse IR background experiment (DIRBE) consists of a cryogenically cooled (to 2 deg K) multiband radiometer used to investigate diffuse infrared radiation from 1 to 300 micrometers. The instrument measures the absolute flux in 10 wavelength bands with a 1-deg field of view pointed 30 deg off the spin axis. Detectors (photoconductors) and filters for the 8 to 100 micrometer channels are the same as for the IRAS mission. Bolometers are used for the longest wavelength channel (120 to 300 micrometers). The DIRBE sensitivity will be better than 2E-12 W/(sq cm-sr) in channels 1 to 3. Channels 4 to 8 will reach 6E-13 while channels 9 and 10, with their less sensitive bolometers but larger etendue, will reach 4E-12. These limits are achievable with existing detectors cooled to near the cryostat temperature of 1.6 deg K. The telescope is a well baffled, off-axis, Gregorian flux collector with re-imaging. The instrument weighs approximately 34 kg, uses 100 W and has a data rate of 1700 bps.

------- COBE, MATHER---

INVESTIGATION NAME- FAR INFRARED ABSOLUTE SPECTROPHOTOMETER (FIRAS)

NSSDC ID- COBE -01 INVESTIGATIVE PROGRAM CODE EZ

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - J.C.	MATHER	NASA-GSFC
OI - R.	WEISS	MASS INST OF TECH
OI - M.G.	HAUSER	NASA-GSFC
OI - D.T.	WILKINSON	PRINCETON U
OI - G.F.	SMOOT	LAWRENCE BERKELEY LAB
OI - S.	GULKIS	NASA-JPL

BRIEF DESCRIPTION

The far-IR absolute spectrophotometer (FIRAS) is a cryogenically cooled polarizing Michelson interferometer used as a Fourier transform spectrometer. The instrument points along the spin axis and has a 7-deg field of view. This device measures the spectrum to a precision of 1/1000 of the peak flux at 1.7 mm for each 7-deg field of view on the sky (over the range 0.1 to 10 mm). The FIRAS uses a special flared trumpet horn flux collector having very low sidelobe levels and an external calibrator covering the entire beam; precise temperature regulation and calibration are required. The instrument has a differential input to compare the sky with an internal reference at 3 deg K. This feature provides immunity from systematic errors in the spectrometer, and contributes significantly to the ability to detect small deviations from a blackbody spectrum. The instrument weighs 60 kg, uses 84 W and has a data rate of 1200 bps.

------- COBE, SMOOT---

INVESTIGATION NAME- DIFFERENTIAL MICROWAVE RADIOMETERS (DMR)

NSSDC ID- COBE -03 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - G.F.	SMOOT	LAWRENCE BERKELEY LAB
OI - S.	GULKIS	NASA-JPL
OI - D.T.	WILKINSON	PRINCETON U
OI - J.C.	MATHER	NASA-GSFC
OI - M.G.	HAUSER	NASA-GSFC
OI - R.	WEISS	MASS INST OF TECH

BRIEF DESCRIPTION

The differential microwave radiometer (DMR) investigation uses three differential radiometers to map the sky at 31.4, 53, and 90 GHz. The radiometers are distributed around the outer surface of the cryostat. Each radiometer employs a pair of horn antennas viewing at 30 deg from the spin axis of the spacecraft, measuring the differential temperature between points in the sky separated by 60 deg. At each frequency there are two channels for dual polarization measurements for improved sensitivity and for reliability. Each radiometer is a microwave receiver whose input is switched rapidly between the two horn antennas, obtaining the difference in brightness of two fields of view 7 deg in diameter located 60 deg apart and 30 deg from the axis of the spacecraft. High sensitivity is achieved by temperature stabilization (at 300 deg K for 31.4 GHz and at 140 deg K for 53 and 90 GHz), by spacecraft spin, and by the ability to integrate over the entire year. Sensitivity to large-scale anisotropies is about 3E-5 deg K. The instrument weighs 120 kg, uses 114 W, and has a data rate of 500 bps.

*************************** CRRES***************************

SPACECRAFT COMMON NAME- CRRES
ALTERNATE NAMES- CHEM RELEASE+RAD EFF SAT

NSSDC ID- CRRES

LAUNCH DATE- 07/00/87 WEIGHT- 4383. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY

UNITED STATES	NASA-OSSA
UNITED STATES	DOD-USAF
UNITED STATES	DOD-NAVY

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- MIN INCLINATION- 28.5 DEG
PERIAPSIS- 300. KM ALT APOAPSIS- 300. KM ALT

PERSONNEL

MG - D.S.	DILLER	NASA HEADQUARTERS
MG - W.B.	FRATZKE	USAF SPACE DIVISION
SC - J.	LYNCH	NASA HEADQUARTERS
PM - J.F.	STONE	NASA-MSFC
PM - E.G.	MULLEN	USAF GEOPHYS LAB
PS - D.L.	REASONER	NASA-MSFC
PS - M.S.	GUSSENHOVEN	USAF GEOPHYS LAB

BRIEF DESCRIPTION

The Combined Release and Radiation Effects Satellite (CRRES) Program is comprised of several elements. One is the release of powdered and liquid chemicals during the first 45 to 60 days after launch, when the spacecraft is in its 300-km altitude circular orbit. These releases are used to study electric fields, neutral winds, and other phenomena in the upper atmosphere, the ionosphere, and the magnetosphere. The spacecraft spins at 20 rpm during the low altitude orbit phase of the program. After the chemical releases are completed, the satellite is boosted into a geosynchronous-transfer-type orbit and spun down to 2 rpm. The orbit parameters of this final orbit are as follows: apogee altitude - 35,800 km, perigee altitude - 400 km, period - 630 min, inclination - about 16 deg. As the satellite traverses the inner magnetosphere, a full complement of field, particle, and plasma instruments measures the radiation environment. A comprehensive set of state-of-the-art microelectronics devices and other spacecraft components are tested in orbit for radiation effects. A major segment of the CRRES payload is part of AFGL's Space Radiation Effects Program (SPACERAD). The SPACERAD Program is a comprehensive space and ground test effort to (a) measure radiation-induced single event upsets and total dose degradation of state-of-the-art microelectronics devices, including VHSIC and GaAs, in a known space environment; (b) perform laboratory radiation response and annealing characterization of parts identical to those flown on CRRES; (c) develop algorithms to relate space performance of microelectronic components to ground test procedures, and update existing radiation ground test guidelines to more accurately simulate the behavior of devices in space; (d) space qualify advanced technology devices for use in operational systems; (e) update the static models of the radiation belts; and (f) develop the first dynamic models of the high-energy particle populations. The on-orbit phase of SPACERAD lasts for about 3 years. In addition, there are other radiation belt experiments on CRRES provided by the Navy. The CRRES spacecraft has the shape of an octagonal prism with solar arrays on the top side. The prism is 1 m high and 3 m between opposite faces. Four of the eight compartments are for the chemical canisters and the other four house the SPACERAD and other experiments. The spin axis of CRRES is controlled so that it points at the sun.

------- CRRES, ANDERSON---

INVESTIGATION NAME- SEARCH COIL MAGNETOMETER (AFGL 701-13)

NSSDC ID- CRRES -20 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - R.R.	ANDERSON	U OF IOWA
OI - D.A.	GURNETT	U OF IOWA

BRIEF DESCRIPTION

The purpose of this experiment is to obtain the magnetic field component of plasma waves in the frequency range of 5.6 Hz - 10 kHz. The search coil magnetometer contains a high permeability mu-metal core, 0.4 m long, with 10,000 turns of 42-gauge wire wound around it, and a preamplifier. The output is fed to a multichannel spectrum analyzer, with 14 simultaneous channels. The bandwidth of each channel is 0.3 times the center frequency, except at the frequencies of 5.62 kHz and 10.0 kHz at which the bandwidth is 1.5 times the center frequency. Each of the 14 outputs is sampled 8 times per second for telemetering. The spectrum analyzer is alternately fed by the search coil and a long E-field antenna (see CRRES -22).

------- CRRES, ANDERSON---

INVESTIGATION NAME- PASSIVE PLASMA SOUNDER (PPS)
(AFGL 701-15)

NSSDC ID- CRRES -22 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - R.R.	ANDERSON	U OF IOWA
OI - D.A.	GURNETT	U OF IOWA

BRIEF DESCRIPTION

The purpose of this experiment is to measure the electric field components of the most important and prevalent plasma waves in the magnetosphere. This particular experiment is concerned with the waves in the frequency range of 100 Hz to 400 kHz. Signals induced in a 100-m-long dipole are channelled to a 4-band sweep-frequency receiver. Band 1 (100 - 810 Hz) is swept through in 32 s; band 2 (810 Hz - 6.4 kHz) in 16 s; band 3 (6.4 - 51.7 kHz) and band 4 (51.7 - 400 kHz) in 8 s. The sweeps are not continuous, but in discrete step frequencies, with 32 frequency channels in each band. The channel bandwidths of the four bands are, respectively, 7 Hz, 56 Hz, 448 Hz, and 3.6 kHz. The dynamic range of each channel is 100 dB. In the limited frequency range of 5.6 Hz - 10 kHz, a companion experiment (see CRRES-20) provides the magnetic components of the waves, by means of a search coil magnetometer (SCM) and a multichannel spectrum analyzer (MSA). This MSA is alternately fed by the SCM and the long E-field antenna.

------- CRRES, BLAKE---

INVESTIGATION NAME- OMNI PROTON TELEMETRY ALLOCATION SWITCH
(AFGL-701-7B)

NSSDC ID- CRRES -14 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - J.B.	BLAKE	AEROSPACE CORP
OI - A.	KOLASINSKI	AEROSPACE CORP

BRIEF DESCRIPTION

This proton switch consists of two lithium-drifted silicon detectors each centered under a hemispherical aluminum dome. These detectors measure the flux of protons in the energy range 20 - 80 MeV. The main use of this instrument is to signal the spacecraft Data Processing Unit that protons are present so that the telemetry allocations for certain experiments are changed.

------- CRRES, BURKE---

INVESTIGATION NAME- LANGMUIR PROBE (AFGL 701-14)

ORIGINAL PAGE IS
OF POOR QUALITY

NSSDC ID- CRRES -21 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - W.J.	BURKE	USAF GEOPHYS LAB
OI - W.P.	SULLIVAN	USAF GEOPHYS LAB
OI - M.	SMIDDY	USAF GEOPHYS LAB
OI - J.R.	WYGANT	U OF CALIF, BERKELEY
OI - P.R.	HARVEY	U OF CALIF, BERKELEY
OI - F.S.	MOZER	U OF CALIF, BERKELEY
OI - R.B.	TORBERT	U OF CALIF, SAN DIEGO
OI - M.C.	KELLEY	CORNELL U
OI - N.C.	MAYNARD	USAF GEOPHYS LAB

BRIEF DESCRIPTION

The Langmuir probe is designed to measure the temperature and density of cold electrons and the electric fields in the magnetosphere, as well as their spatial and temporal fluctuations. The purpose is to better understand the wave-particle interactions. The probe instrument consists of two pairs of orthogonal booms with tip-to-tip separations of 100 m. They are located in the spin plane of the satellite. One pair of booms carries spherical sensors and the other cylindrical antennas. An onboard microprocessor controls the operating mode. In the Langmuir probe mode the spherical sensors are biased at fixed potentials relative to the ambient plasma and the currents collected by the sensors provide the temperature and the density of the plasma electrons. In the electric field mode both pairs of sensors are current-biased and monitor the electric field. The energy range of the measured ambient plasma is up to 10 eV and the frequency range of the measured electric field is from dc to 1 kHz.

------- CRRES, FRITZ---

INVESTIGATION NAME- MEDIUM ENERGY ION COMPOSITION
(AFGL 701-11A)

NSSDC ID- CRRES -16 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - T.A.	FRITZ	LOS ALAMOS NAT LAB
OI - D.T.	YOUNG	LOS ALAMOS NAT LAB
OI - W.C.	FELDMAN	LOS ALAMOS NAT LAB
OI - S.J.	BAME	LOS ALAMOS NAT LAB
OI - J.R.	CESSNA	LOS ALAMOS NAT LAB
OI - D.N.	BAKER	LOS ALAMOS NAT LAB
OI - B.	WILKEN	MPI-AERONOMY
OI - W.	STUDEMANN	MPI-AERONOMY
OI - P.	WINTERHOFF	MPI-AERONOMY
OI - D.A.	BRYANT	RUTHERFORD APPLETON L.
OI - D.S.	HALL	RUTHERFORD APPLETON L.
OI - J.F.	FENNELL	AEROSPACE CORP
OI - D.	CHENETTE	AEROSPACE CORP
OI - N.	KATZ	AEROSPACE CORP
OI - S.I.	IMAMOTO	AEROSPACE CORP
OI - R.	KOGA	AEROSPACE CORP

BRIEF DESCRIPTION

The magnetospheric ion composition sensor (MICS) used in this experiment enables determination of the mass and energy/Q spectra of the ions in the range 30 to 400 keV/Q. The sensor consists of a conically shaped electrostatic energy analyzer (EES) and a time-of-flight (TOF) analyzer. The EES specifies the energy per charge of the incident ion and the TOF provides the speed. Together they enable determination of the energy spectrum for each mass up to 56 amu. After passing through the EES, an ion passes through a thin carbon foil and then through another carbon foil at the end of the flight path. The secondary electrons emitted by the foils provide the time of flight and hence the speed. The field of view is a 2-deg cone, at an angle of 90 deg from the spin axis of the satellite. The energy resolution is 10% at each energy and the geometric factor is 1.0E-2 sq cm-sr. The sensitivity ranges from single particle events to a flux of 5.E7 particles/(sq cm-sr-s).

------- CRRES, FRITZ---

INVESTIGATION NAME- LOW ENERGY ION COMPOSITION
(AFGL-701-11B)

NSSDC ID- CRRES -17 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - T.A.	FRITZ	LOS ALAMOS NAT LAB
OI - D.T.	YOUNG	LOS ALAMOS NAT LAB
OI - W.C.	FELDMAN	LOS ALAMOS NAT LAB
OI - S.J.	BAME	LOS ALAMOS NAT LAB
OI - D.N.	BAKER	LOS ALAMOS NAT LAB
OI - B.	WILKEN	MPI-AERONOMY
OI - W.	STUDEMANN	MPI-AERONOMY
OI - P.	WINTERHOFF	MPI-AERONOMY
OI - D.A.	BRYANT	RUTHERFORD APPLETON L.
OI - D.S.	HALL	RUTHERFORD APPLETON L.
OI - J.F.	FENNELL	AEROSPACE CORP
OI - D.	CHENETTE	AEROSPACE CORP
OI - N.	KATZ	AEROSPACE CORP
OI - S.I.	IMAMOTO	AEROSPACE CORP
OI - R.	KOGA	AEROSPACE CORP
OI - J.R.	CESSNA	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

This experiment utilizes a low energy magnetospheric ion composition sensor (LOMICS) to obtain fluxes of ions up to mass 56 amu in the energy/Q range of 40 eV/Q to 40 keV/Q. The energy of the ion entering the instrument is determined by a 90-deg spherical section electrostatic energy analyzer (EEA). It is followed by a time-of-flight (TOF) analyzer which yields the speed of the ion. Together the two analyzers specify the mass and energy/charge of each ion. Generally, TOF analyzers are unsuitable for low energy ions; but it is overcome by providing each ion with an extra energy of 10 keV after it passed through the EEA. To determine the time of flight of the ion through a known path length, two very thin carbon foils (100 A), one at the entrance and the other at the exit of the TOF chamber, are used. The secondary electrons emitted by these foils are accelerated, deflected and focused onto an 18-mm diameter microchannel plate to provide the start and stop times of the flight. Three stop foils are used, corresponding to the three incident angles of the ions: 60, 90, and 120 deg from the spin axis of the satellite. The field of view at each of these angles is 12 deg by 15 deg. The energy resolution is 7.5% of the ion energy and the geometric factor is 3.8E-4 sq cm-sr. The system can detect the incidence of a single ion as well as fluxes up to 5.E7 particles/(sq cm-sr-s).

------- CRRES, FRITZ---

INVESTIGATION NAME- HEAVY ION TELESCOPE (AFGL 701-11C)

NSSDC ID- CRRES -18 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - T.A.	FRITZ	LOS ALAMOS NAT LAB
OI - D.T.	YOUNG	LOS ALAMOS NAT LAB
OI - W.C.	FELDMAN	LOS ALAMOS NAT LAB
OI - S.J.	BAME	LOS ALAMOS NAT LAB
OI - J.R.	CESSNA	LOS ALAMOS NAT LAB
OI - D.N.	BAKER	LOS ALAMOS NAT LAB
OI - B.	WILKEN	MPI-AERONOMY
OI - W.	STUDEMANN	MPI-AERONOMY
OI - P.	WINTERHOFF	MPI-AERONOMY
OI - D.A.	BRYANT	RUTHERFORD APPLETON L.
OI - D.S.	HALL	RUTHERFORD APPLETON L.
OI - D.	CHENETTE	AEROSPACE CORP
OI - N.	KATZ	AEROSPACE CORP
OI - S.I.	IMAMOTO	AEROSPACE CORP
OI - R.	KOGA	AEROSPACE CORP
OI - J.F.	FENNELL	AEROSPACE CORP

BRIEF DESCRIPTION

The heavy ion telescope (HIT) uses a three-element solid state detector to measure the energy loss, incident ion energy and the time of flight along a fixed length. These three parameters enable unique determination of the ion mass, elemental identification and incident energy over the range of 100 keV to 15 MeV per ion. The first detector measures the small energy loss of the ion in passing through it and the second detector measures the total energy of the ion. The third detector is in anticoincidence with the second and helps to ascertain that the ion was completely stopped by the second. The time of flight along a 7.6-cm track is measured by the almost instantaneous emission of secondary electrons by the first and second detectors. The measured energy loss, total energy and the time of flight are digitized and transferred to the data processing unit for telemetering.

------- CRRES, HARDY---

INVESTIGATION NAME- THE SPACE RADIATION DOSIMETER (AFGL-701)

NSSDC ID- CRRES -07 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI - D.A.	HARDY	USAF GEOPHYS LAB
OI - F.A.	HANSER	PANAMETRICS, INC.
OI - B.	SELLERS	PANAMETRICS, INC.

BRIEF DESCRIPTION

The primary purpose of the Space Radiation Dosimeter is to measure the radiation dose from both electrons and protons as well as the number of nuclear star events occurring behind four different thicknesses of aluminum shielding. In addition, it provides some information on the integral flux of electrons and protons at energies above the thresholds defined by the shields. The experiment will provide information on the relationship between the flux of high-energy particles incident to the spacecraft and the actual radiation dose to which

microelectronic components are exposed. This information is required for determination of the relationship between variations in the earth's radiation belts and the behavior and lifetime of microelectronic components. The basic measurement technique is to determine the amount of energy deposition occurring in a simple solid-state detector from particles with sufficient energy to penetrate an omnidirectional aluminum shield of known thickness.

------- CRRES, HARDY---

INVESTIGATION NAME- HIGH-ENERGY ELECTRON FLUXMETER (HEEF)
(AFGL-701-4)

NSSDC ID- CRRES -09

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - D.A.	HARDY	USAF GEOPHYS LAB
OI - F.A.	HANSER	PANAMETRICS, INC.
OI - B.	SELLERS	PANAMETRICS, INC.

BRIEF DESCRIPTION

This instrument consists of a three-element electron telescope with an anticoincidence element that provides for the measurement of the differential energy spectrum in the range 1 to 10 MeV. Two solid-state detectors, 700 micrometers thick, form the first two elements of this system. The detector areas, in units of square mm, are: front - 100; second - 50. The final element of the the telescope is a BGO scintillation crystal coupled to a photomultiplier tube (PMT). An annular plastic scintillator surrounding the BGO crystal and viewed by two PMTs comprises the guard counter. The system is mounted in a magnesium housing with an inner tungsten shield around the BGO and plastic crystal detectors. Two slabs of tungsten serve as collimators to define the entrance aperture. The geometric factor for the system is 1.2E-2 sq cm-sr. Only electrons with energies above 1 MeV stopping in the BGO crystal are pulse-height analyzed into 10 bins. The lower six bins provide 0.5-MeV windows; the next 2 bins provide 1-MeV windows; and the last two provide 2-MeV windows. Consequently, the detail of the spectrum is good enough for radiation belt modeling. Proton rejection is quite good since the shielding, the pulse-height information in the three telescope elements, and the guard counter anticoincidence all contribute. The time accumulation of 0.5 s determines the time resolution of the investigation.

------- CRRES, HARDY---

INVESTIGATION NAME- LOW-ENERGY PLASMA ANALYZER (LEPA)
(AFGL-701-6)

NSSDC ID- CRRES -12

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - D.A.	HARDY	USAF GEOPHYS LAB
OI - A.D.	JOHNSTONE	MULLARD SPACE SCI LAB
OI - M.	SMITH	MULLARD SPACE SCI LAB
OI - A.	HUBER	EMMANUEL COLLEGE
OI - J.	PANTAZIS	EMMANUEL COLLEGE
OI - R.	BURKHARDT	EMMANUEL COLLEGE
OI - M.P.	GOUGH	U OF SUSSEX

BRIEF DESCRIPTION

The LEPA consists of two 260-deg spherical electrostatic analyzers and associated digital boards and microprocessors to allow a number of sophisticated measurements to be made. One analyzer is used to measure electrons in the 10 eV - 30 keV energy range; the other one measures ions over the same interval. An analyzer aperture limits the entrance angles to a 5.6- by 128-deg fan and the analyzer detector is a microchannel plate with discrete anodes. The anodes allow the 128-deg fan to be sensed in 16 windows each 8 deg wide. One of these windows can be selected and then angular resolution down to 1 deg can be obtained. The analyzers provide a delta E/E of 0.03. A particle correlator board is used to sense the arrival time of each electron or ion within each 8-deg zone so that wave-particle interactions can be sensed. In addition, the correlator uses the ac signal from the electric field antenna. The number of voltage steps per sweep on the analyzers can be set between 1 and 128. A 30-point spectrum can be obtained in 0.5 s; increasing the number of points increases the time linearly. A sequence of measurements can be stored in the experiment memory so that such measurements can be repeated each half spin period (about 15 s).

------- CRRES, HEPPNER---

INVESTIGATION NAME- CHEMICAL RELEASE EXPERIMENTS

NSSDC ID- CRRES -06

INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES

PERSONNEL

PI - J.P.	HEPPNER	NASA-GSFC

BRIEF DESCRIPTION

The chemical release experiment consists of up to 1000 kg of powdered and liquid chemicals in up to 40 ejectable canisters, to be released during Phase I of the CRRES mission. These releases have a large number of objectives which include learning more about upper atmosphere dynamics, magnetospheric and ionospheric physics, and space plasma physics. In early 1985 this investigation will be divided into 14 separate investigations.

------- CRRES, IMHOF---

INVESTIGATION NAME- SPECTROMETER FOR ELECTRONS AND PROTONS
(SEP) (ONR-307-3)

NSSDC ID- CRRES -03

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - W.L.	IMHOF	LOCKHEED PALO ALTO
OI - J.B.	REAGAN	LOCKHEED PALO ALTO
OI - E.E.	GAINES	LOCKHEED PALO ALTO
OI - S.J.	BATTEL	LOCKHEED PALO ALTO
OI - D.A.	SIMPSON	LOCKHEED PALO ALTO
OI - R.R.	VONDRAK	LOCKHEED PALO ALTO
OI - M.D.	VOSS	LOCKHEED PALO ALTO

BRIEF DESCRIPTION

The overall objective of this investigation is to obtain the necessary data to construct predictive models of the energetic particle and plasma environment in the inner magnetosphere. The instrument consists of three identical particle telescopes composed of surface barrier silicon detectors with an active anticoincidence shield provided by a cup-shaped plastic scintillation counter viewed by a photomultiplier tube. By the use of an aluminum collimator the entrance beam is restricted to 3 deg (FWHM). The three spectrometers are mounted at 40, 60, and 80 deg with respect to the spacecraft spin axis to obtain a wide range of pitch angles. Operating modes are defined by specifying the logic conditions, gain, and energy thresholds required between the four detector elements that are used in each telescope. The first detector, which is 200 micrometers thick and is made of of intrinsic silicon, is used to measure both the rate of energy loss of the higher energy particles and to directly stop and measure the lower energy particles. The middle detector element, which consists of a stack of five 2-mm-thick detectors connected in parallel, is used to stop the higher energy particles and to measure their total energy loss. The third element is a 1-mm-thick detector and is used as an active collimator. Behind this detector is a tungsten absorber that sets the upper energy limit for the analysis since the guard counter cup bottom is behind the three-element telescope. Although there is a wide variety of modes that can be executed, the system is used typically to measure: (a) electrons from 20 to 300 keV in 20-keV bins, (b) electrons from 0.3 to 5 MeV in 0.4-MeV bins, (c) protons from 0.5 to 4.5 MeV in 0.33-MeV bins, (d) protons from 4.5 to 20 MeV in 1.25-MeV bins, (e) protons from 20 to 45 MeV in 2-MeV bins, and (f) protons from 45 to 100 MeV in 4.2-MeV bins.

------- CRRES, KOLASINSKI--

INVESTIGATION NAME- RELATIVISTIC PROTON TIME-OF-FLIGHT
DETECTOR (AFGL-701-7A)

NSSDC ID- CRRES -13

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - A.	KOLASINSKI	AEROSPACE CORP
OI - J.B.	BLAKE	AEROSPACE CORP

BRIEF DESCRIPTION

This instrument consists of two 2.5-cm diameter cylindrical disks of plastic scintillator each viewed by a microchannel plate multiplier and associated electronics to determine the time of flight of the protons between the two sensors. Protons in the energy range 50 - 600 MeV are measured. The two sensors are mounted coaxially at a separation of 30 cm; consequently the time of flight is in the range of about 1 to 7 ns. The timing/logic system provides for five energy channels as well as the singles rate for each detector. The angular resolution is about 40 deg.

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OF POOR QUALITY

------- CRRES, KORTH --

INVESTIGATION NAME- ELECTRON-PROTON-ANGLE-SPECTROMETER (EPAS) (AFGL-701-5B)

NSSDC ID- CRRES -11 INVESTIGATIVE PROGRAM SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S) PARTICLES AND FIELDS MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - A. KORTH MPI-AERONOMY
OI - A.L. VAMPOLA AEROSPACE CORP

BRIEF DESCRIPTION
The EPAS is composed of two identical units each consisting of a collimator, a focusing magnet assembly, a support structure, five solid-state detectors in the focal curve of the magnet assembly for electron detection, and two 2-element solid-state telescopes viewing the collimator through the magnetic field for ion (mainly proton) detection. The magnetic field is homogeneous over most of the volume defined by the pole pieces with a strength of about 0.08 T. The magnetic field geometry is such that electrons of all energies between 16 and 300 keV are deflected through about 180 deg and focused at a point corresponding to the entrance angle of the electron. The five detectors provide five angular intervals within the 60-deg field of view of each unit. The electron energy spectrum is determined by pulse-height analysis of a selected solid-state detector and the energy range is divided into 15 approximately logarithmically spaced channels, which provide a delta E/E of about 0.35. An integral energy channel above 22 keV is also provided. The look directions of the 10 electron detectors with respect to the spacecraft spin axis are 10, 20, 30, 40, 50, 80, 90, 100, 110, and 120 deg. Angular resolutions, in degrees, are: elevation - 3; azimuth - 2. The geometric factor for each detector element is 5.E-5 sq cm-sr. The proton/ion telescopes employ pulse-height analysis of a selected front counter and the 20 to 3300-keV energy interval is divided into 12 approximately logarithmically spaced channels, which provide a delta E/E of about 0.3, except for the highest channel, which covers the range 403 - 3300 keV. An integral energy channel above 27 keV is also provided. The ion angles with respect to the spacecraft spin axis are centered at 23, 46, 83, and 106 deg. Angular resolutions in degrees are: elevation - 5; azimuth - 2. The geometric factor for each telescope is 2.E-4 sq cm-sr.

------- CRRES, QUINN --

INVESTIGATION NAME- LONG ENERGY ION MASS SPECTROMETER (ONR-307-8A)

NSSDC ID- CRRES -23 INVESTIGATIVE PROGRAM SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S) PARTICLES AND FIELDS

PERSONNEL
PI - J.M. QUINN LOCKHEED PALO ALTO
OI - S.J. BATTEL LOCKHEED PALO ALTO
OI - E. HERTZBERG LOCKHEED PALO ALTO
OI - S. ROSELLE LOCKHEED PALO ALTO

BRIEF DESCRIPTION
The low energy ion mass spectrometer (IMS-LO) is designed to measure the energy and mass spectra in the energy/Q range 0.1 - 32 keV/Q and in the mass range 1.0 - 32 amu/Q. The design is very similar to the spectrometers of the Lockheed group on board SCATHA and S3-3 satellites. Two identical instruments, IMS-LO-1 and IMS-LO-2 will be used: one looking at 45 deg and the other at 75 deg with respect to the spin axis of the satellite. The field of view is 5 deg, conical. Each IMS is actually a triplet of spectrometers, covering the three ranges, 0.1 - 0.6 keV/Q, 0.7 - 4.5 keV/Q, and 5 - 32 keV/Q. In turn, each energy range is covered by 15 discrete energy steps, with a duration of 2.084 s at each step. Each of the 6 (3 x 2) spectrometers consists of a Wein velocity filter, followed by an electrostatic energy analyzer (EEA) and then by a channel mutiplier. The geometric factor at any energy is about 4.E-4 sq cm-sr. At each energy step, the velocity filter sequentially samples for 2.084 s the masses in 32 mass steps. The instrments can also be operated in a LOCK submode, in which the mass is held fixed and the range of 0.1 - 32 keV/Q is swept in steps during a total duration of 1.024 s. The two IMS-LO systems can be independently commanded to operate in the SWEEP or the LOCK submode. Four fixed-energy electron detectors are attached to each IMS-LO system, and together the eight electron detectors cover the energy range 50 eV - 25 keV, in 512 ms.

------- CRRES, RICH --

INVESTIGATION NAME- THE FLUXGATE MAGNETOMETER (AFGL-701)

NSSDC ID- CRRES -19 INVESTIGATIVE PROGRAM CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S) PARTICLES AND FIELDS SPACE PLASMAS

PERSONNEL
PI - F.J. RICH USAF GEOPHYS LAB
OI - H.J. SINGER USAF GEOPHYS LAB

BRIEF DESCRIPTION
The purpose of this experiment is to measure the ambient geomagnetic field and low-frequency variations in that field up to 10 Hz. This measurement will be used together with the look angles of the particle experiments (1) to obtain pitch angles of the measured particles, (2) as a diagnostic of global geomagnetic disturbances, (3) as a diagnostic of very low frequency waves in the ambient environment, (4) to provide plasma gyrofrequencies, (5) to measure V x B electric fields, and (6) to provide a secondary source of spacecraft attitude information. Each axis of a triaxial fluxgate magnetometer will be sampled 20 times per second in the range of plus or minus 45,000 nT. The instrument requires a large dynamic range to measure fields near perigee where the field is approximately 45,000 nT and in the vicinity of synchronous orbit where the field is approximately 100 nT or less with periodic variations of amplitude down to fractions of 1 nT. Given the instrument ranges and the 12-bit analog-to-digital converter, the least significant bit resolution in each sensor is approximately 20 nT and approximately 0.4 nT at low and high resolutions, respectively. On command, the signal from one axis of the magnetometer can be amplified six times to provide better amplitude resolution at low field strengths near apogee. The improved sensitivity, which will permit the detection of high-frequency, low-amplitude wave signals from this particular axis, can also be used to add confidence to the increased accuracy obtained from the other axes by digital averaging.

------- CRRES, RIEHL --

INVESTIGATION NAME- PROTON TELESCOPE (PROTEL) (AFGL-701-8 & 9)

NSSDC ID- CRRES -15 INVESTIGATIVE PROGRAM SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S) PARTICLES AND FIELDS MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - K. RIEHL USAF GEOPHYS LAB
OI - D.A. HARDY USAF GEOPHYS LAB
OI - E.A. BOUGHAN MASS INST OF TECH

BRIEF DESCRIPTION
This instrument measures protons in the energy range 1 to 100 MeV. It consists of two separate sensor units and a data processing unit. The low-energy sensor head measures 1 - 9 MeV protons in eight contiguous energy channels and the high-energy sensor head measures 6 - 100 MeV protons in 16 channels. The entire energy spectrum is obtained each second. Both heads have passive shielding, a collimator made of aluminum and tungsten, an electron sweeping magnet with a field strength of 0.5 T, and a silicon detector stack. The acceptance angles (FWHM) are 9.53 and 16.7 deg for the low- and high-energy units, respectively. The magnets remove up to 4- and 8-MeV electrons, respectively. The low-energy sensor uses five surface barrier detectors in the stack. The back detector is used behind some additional shielding to fix the highest energy channel. The high-energy unit uses five lithium-drifted silicon setectors with guard rings to reject penetrating particles and one surface barrier detector. The last detector is used in anticoincidence to define the upper energy channel.

------- CRRES, RITTER --

INVESTIGATION NAME- THE SPACERAD MICROELECTRONICS EXPERIMENT (AFGL-701)

NSSDC ID- CRRES -02 INVESTIGATIVE PROGRAM CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S) MAGNETOSPHERIC PHYSICS PARTICLES AND FIELDS

PERSONNEL
PI - J.C. RITTER US NAVAL RESEARCH LAB
OI - W.B. HUBER USAF GEOPHYS LAB
OI - W.C. TOLMAN ASSURANCE TECH CORP
OI - R. GONYEA TELENETICS CORP

BRIEF DESCRIPTION
The purpose of the SPACERAD Microelectronics Experiment is to study radiation-induced single event upsets (SEUs) and total dose damage in advanced microelectronic devices in the measured space environment and at particle accelerators. The space experiment monitors the operations of state-of-the-art silicon devices, VHSIC (Very High Speed Integrated Circuit) devices, and advanced material devices such as gallium arsenide (GaAs) random access memories (RAMs). The devices are selected by virtue of their present and proposed use in DOD and NASA

space programs and for their scientific interest such as comparing feature sizes, technologies, or materials, etc. The space experiment is complemented by ground test and device modeling results with space measurements. Ground testing of devices from the same lot and wafer (when available) are used in conjunction with present radiation belt and device models to predict the expected SEUs in space, prior to flight. The satellite contains a complete set of particle instruments to measure simultaneously the space environment including cosmic rays, high-energy protons, and high-energy electrons. Thus, the SEUs and the total dose damage is directly related to the particle environments producing them. Space results are used to check model predictions and determine the validity of ground test procedures and existing device models.

------- CRRES, RITTER---

INVESTIGATION NAME- THE METAL OXIDE SEMICONDUCTOR DOSIMETER (AFGL-701)

NSSDC ID- CRRES -08

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI - J.C.	RITTER	US NAVAL RESEARCH LAB
OI - L.S.	AUGUST	US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

The objective of the Metal Oxide Semiconductor (MOS) Dosimeter is to measure integrated dose, D, of electrons and protons as a function of depth in aluminum. Radiation-soft, PMOS transistors are placed beneath various thicknesses of aluminum in order to get the desired dose-depth curve. The integrated dose is determined by measuring the shift in transistor threshold voltage. The relationship between shift in threshold voltage and D is determined with a calibrated radiation source, usually Co-60 gamma rays.

------- CRRES, ROBINSON---

INVESTIGATION NAME- THE INTERNAL DISCHARGE MONITOR (AGL-701)

NSSDC ID- CRRES -05

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL

PI - R.	ROBINSON	NASA-JPL
OI - J.M.	CONLEY	NASA-JPL

BRIEF DESCRIPTION

The objective of the Internal Discharge Monitor (IDM) experiment is to characterize internal electrostatic discharge events that may damage or upset (disturb) electronic circuits in spacecraft subjected to high energy, charged-particle radiation environments. Discharges due to high-energy electron charge buildup have been tentatively identified as the cause of anomalies on the Voyager and other spacecraft operating in intense electron radiation fields. These discharges are apparently the result of penetrating electrons which are stopped in electronic dielectric materials inside the spacecraft. After sufficient charge has accumulated within the dielectric, a discharge may occur to nearby electronics or cabling, resulting in upset or damage to sensitive components. The IDM experiment is part of the on-going electron-caused electromagnetic pulse effort of the Air Force Weapons Laboratory. The IDM experiment is designed to determine whether or not internal discharge phenomena indeed occur under the CRRES orbital conditions and, if so, to measure the characteristics of the discharge. A total of 16 dielectric samples will be tested in the IDM instrument. The dielectric materials and geometric configurations were selected following ground tests in which samples were irradiated with 1- to 3-MeV electrons in the JPL dynamitron. The experiment data will be correlated with the orbital environment to determine the quantitative dependence of the discharge phenomena on ionizing radiation flux and spectrum, and on material properties.

------- CRRES, SIMPSON---

INVESTIGATION NAME- HIGH ENERGY HEAVY NUCLEI COMPOSITION (ONR-604)

NSSDC ID- CRRES -01

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS
PARTICLES AND FIELDS

PERSONNEL

PI - J.A.	SIMPSON	U OF CHICAGO
OI - M.	GARCIA-MUNOZ	U OF CHICAGO
OI - M.	PERKINS	U OF CHICAGO
OI - J.	WEFEL	LOUISIANA STATE U

BRIEF DESCRIPTION

The core of this instrument consists of a stack of lithium-drifted silicon detectors (11 sq cm by 0.5 cm) to measure the energy loss in each detector and the residual energy remaining in the energetic ion that enters the instrument. Hence the elemental composition and the energy spectrum of each element are obtained. The energy range covered is 20 - 500 MeV/amu. Since isotopic composition is sought, the energy loss in each detector and the residual energy are measured to a precision of 0.1%. The high degree of mass resolution that is sought requires also that the obliquity of the path of the ion in the instrument is measured to an accuracy of better than 1 deg. This precision is accomplished by an orthogonal pair of position-sensing detectors (PSD) consisting of gold strips connected to an external chain of resistors. For the sake of redundancy, each PSD is actually a stacked triplet of detectors, with different orientations of the mesh. An additional precaution is required to eliminate the ions which, after passing through one or more of the detectors, reach the wall of the instrument. The elimination is accomplished by providing a guard ring of scintillating material and detecting the event by a photomultiplier, in anticoincidence with the detectors. The field of view of the instrument is 90 deg, conical, with an angular resolution of 1 deg. The geometric factor is energy dependent and varies from 8 to 3 sq cm-sr, for the 20 - 500 MeV/amu range.

------- CRRES, TRUMBLE---

INVESTIGATION NAME- GALLIUM ARSENIDE SOLAR CELL PANEL EXPERIMENT (AFAPL-801)

NSSDC ID- CRRES -04

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

PI - T.M.	TRUMBLE	USAF WRIGHT AERON. LAB

BRIEF DESCRIPTION

One of the main objectives of the Gallium Arsenide Solar Cell Panel Experiment is to measure in the space environment the performance characteristics of differently configured advanced solar cell strings while simultaneously measuring the incident radiation species (protons, electrons, ions), their flux levels, and energy distributions. Another objective is to quantify radiation damage of gallium arsenide and advanced silicon solar cells, and also to evaluate annealing processes of radiation. This experiment will be used to determine optimum panel annealing parameters and operating characteristics and to determine the optimum configuration of solar cell panels operating in a high radiation environment.

------- CRRES, VAMPOLA---

INVESTIGATION NAME- MEDIUM-ENERGY ELECTRON SPECTROMETER (AFGL-701-5A)

NSSDC ID- CRRES -10

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - A.L.	VAMPOLA	AEROSPACE CORP
OI - A.	KORTH	MPI-AERONOMY

BRIEF DESCRIPTION

This electron spectrometer is associated with the EPAS (CRRES-11) but is a separate instrument consisting of a 0.085-T magnet assembly, a tungsten collimator, 18 lithium-drifted solid-state detectors placed in the focal plane of the 180-deg focusing magnet, shielding, Indox V pole pieces, and both internal and external disk-loaded collimators. The internal collimators prevent scattered particles from being measured and, along with the external collimators, define the acceptance angle for the instrument. The acceptance angle in the horizontal direction (parallel to the pole piece faces) is plus or minus 11 deg and is independent of energy. In the vertical direction the angle varies with energy; it is plus or minus 11 deg for the lowest energy channel (46.8 - 107 keV) and drops to plus or minus 3 deg for the highest energy channel (2100 - 2200 keV). The 15 energy channels between these extremes provide a delta E/E starting at about 0.5 and decrease with energy to about 0.06. The final counter is shielded to provide a background measurement for protons and bremsstrahlung. The geometric factors, in units of square millimeters-steradians-kiloelectron volts, vary with energy, starting at 4.74 for the first, or lowest, energy channel, peaking at 5.67 for the third energy channel, and falling monotonically to 2.15 for the highest energy channel. The aperture is perpendicular to the spin axis of the spacecraft with the horizontal direction pointing along the spin axis.

------- CRRES, VOSS---

INVESTIGATION NAME- MEDIUM ENERGY ION MASS SPECTROMETER (ONR 307-8B)

NSSDC ID- CRRES -24

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - H.D.	VOSS	LOCKHEED PALO ALTO
OI - A.G.	GHIELMETTI	U OF BERNE
OI - S.J.	BATTEL	LOCKHEED PALO ALTO
OI - K.L.	APPERT	LOCKHEED PALO ALTO
OI - R.R.	VONDRAK	LOCKHEED PALO ALTO

BRIEF DESCRIPTION

The medium energy ion mass spectrometer (named IMS-HI) is designed to measure the ring current ions in the energy/Q range of 20 keV/Q to 8 MeV/Q for protons, but with proportionately smaller ranges for the heavier atomic mass ions. It is accomplished by making a narrowly collimated stream of incident ions pass into a cross-magnetic field chamber with a field strength of 7 kG, which curves the trajectory toward one of the six cooled (-50 C) solid state detectors (n-type silicon). The momentum per charge of an ion determines the detector that it will reach. In turn, the energy of that ion is detected by that detector. The instrument can therefore provide differential energy spectra for all ions from hydrogen through barium, in the appropriate energy ranges. A broom magnet at the entrance to the magnetic field chamber expels all electrons of energy less than 1 MeV and helps to minimize spurious counts. In addition to the ions, the instrument can also measure the energetic neutral atoms by means of a seventh detector (p-type silicon) located straight across from the entrance hole. The collimator has a conical field of view of 4 deg and a view direction which is at an angle 75 deg with respect to the spin axis of the satellite.

**************************** DMSP 5D-2/SX**********************

SPACECRAFT COMMON NAME- DMSP 5D-2/SX
ALTERNATE NAMES- DMSP BLOCK 5D-2, DMSP 5D-2/S8
DMSP 5D-2/S9, DMSP 5D-2/S10
DMSP 5D-2/S11, DMSP 5D-2/S12
DMSP 5D-2/S13, DMSP 5D-2/S14

NSSDC ID- DMSP-SX

LAUNCH DATE- WEIGHT- 470. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS E

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 100. MIN INCLINATION- 98. DEG
PERIAPSIS- 600. KM ALT APOAPSIS- 600. KM ALT

PERSONNEL
MG - J. RIVERS USAF SPACE DIVISION

BRIEF DESCRIPTION

DMSP 5D-2/SX is the generic name given by NSSDC to the planned members of a series of meteorological satellites developed and operated by the Air Force under the Defense Meteorological Satellite Program (DMSP). Satellites numbered S8 to S14 are described in this version of RAPSE. This program, previously known as DAPP (Data Acquisition and Processing Program), was classified until March 1973. The objective of this program is to provide global visual and infrared cloudcover data and specialized environmental data to support Department of Defense operational weather analysis and forecasting requirements. Operationally, the program consists of two satellites in sun-synchronous polar orbits, with the ascending node of one satellite in early morning and the other at local noon. Each 6.4-m-long spacecraft is separated into four sections: (1) a precision mounting platform for sensors and equipment requiring precise alignment; (2) an equipment support module containing the electronics, reaction wheels, and some meteorological sensors; (3) a reaction control equipment support structure containing the third-stage rocket motor and supporting the ascent phase reaction control equipment; and (4) a 9.29-sq-m solar cell panel. The spacecraft stabilization is controlled by a combination flywheel and magnetic control coil system so that sensors are maintained in the desired earth-looking mode. One feature is the precision-pointing accuracy of the primary imager to 0.01 deg provided by a star sensor and an updated ephemeris navigation system. This allows automatic geographical mapping of the digital imagery to the nearest picture element. On each satellite the operational linescan system is the primary data acquisition system that provides real-time or stored, multi-orbit, day-and-night, visual and infrared imagery of clouds. A supplementary sensor package can contain up to seven special sensors: (1) a microwave temperature sounder, (2) an X-ray spectrometer, (3) an ionospheric/scintillation monitor, (4) a precipitating electron/ion spectrometer, (5) a microwave imager, (6) a magnetometer, and (7) an infrared temperature and moisture sounder. The launch dates and the lists of special sensors contained on each planned satellite in the DMSP 5D-2/SX series are given in Table 1 below. Either recorded or real-time data are transmitted to ground-receiving sites by two redundant S-band transmitters. Recorded data are read out to tracking sites located at Fairchild AFB, Washington, and at Loring AFB, Maine, and relayed by SATCOM to Air Force Global Weather Central, Offutt AFB, Nebraska. Real-time data are read out at mobile tactical sites located around the world. Additional information concerning this satellite series can be found in the report by D. A. Nichols, "The defense meteorological satellite program," Optical Engineering, v. 14, n. 4, p. 273, July-August 1975.

------- DMSP 5D-2/SX, AFGWC STAFF-----------------------------

INVESTIGATION NAME- OPERATIONAL LINESCAN SYSTEM (OLS)

NSSDC ID- DMSP-SX-01

INVESTIGATIVE PROGRAM
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - AFGWC STAFF GLOBAL WEATHER CTR

BRIEF DESCRIPTION

The Operational Linescan System (OLS) is the primary experiment on the DMSP Block 5D spacecraft. The purpose of this experiment is to provide global day and night observations of cloud cover and measurements of cloud top and sea surface temperature and scene albedo. The OLS employs a scanning optical telescope driven in an oscillating motion, with optical compensation for image motion, which results in near-constant resolution throughout the sensor field of view. The radiometer operates in two ("light" and "thermal") spectral intervals: (1) visible and near infrared (0.4 to 1.1 micrometers) and (2) infrared (10.2 to 12.8 micrometers). The radiometer produces, with onboard processing, data in four modes: LF (light fine) and TF (thermal fine) data with a resolution of .56 km, and LS (light smoothed) and TS (thermal smoothed) data, with a resolution of 2.8 km. There are four onboard recorders, and each has a storage capability of 400 min of both LS and TS data or 20 min of LF and TF data. For direct readout to tactical sites, the experiment is programmed so that LF and TS data are obtained at night. The infrared data (TF and TS) cover a temperature range of 190 to 310 deg K with an accuracy of at best 2 deg K. The LS data mode provides visual data through a dynamic range from full sunlight down to a quarter moon. This mode also automatically adjusts the gain along the scan to allow useful data to be obtained across the terminator. Additional information on this experiment is contained in the report by D. A. Nichols, "Primary optical subsystems for DMSP Block 5D," Optical Engineering, v. 14, n. 4, p. 273, July-August 1975.

------- DMSP 5D-2/SX, AFGWC STAFF-----------------------------

INVESTIGATION NAME- MICROWAVE IMAGER (SSM/I)

NSSDC ID- DMSP-SX-02

INVESTIGATIVE PROGRAM
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)
OCEANOGRAPHY
METEOROLOGY

PERSONNEL
PI - AFGWC STAFF GLOBAL WEATHER CTR

BRIEF DESCRIPTION

The purpose of the microwave imager is to provide day and night measurements of ocean surface wind speed, ice coverage and age, area and intensity of precipitation, cloud water content and land surface moisture. An estimate of atmospheric attenuation at each of the four sensor frequencies is also available. Microwave brightness temperatures are obtained with a seven-channel passive microwave radiometer operating at four frequencies, three with both vertical and horizontal polarization (19.35, 37.0, 85.5 GHz) and one with vertical polarization (22.23 GHz). The instrument scans across the ground track to gather data over a 1400-km swath width with horizontal resolutions of 13 to 50 km for different frequencies. The data can be used for tropical storm reconnaissance, ship routing in polar regions, agricultural weather, aircraft routing and refueling, etc.

------- DMSP 5D-2/SX, AFGWC STAFF-----------------------------

INVESTIGATION NAME- MICROWAVE TEMPERATURE SOUNDER (SSM/T)

NSSDC ID- DMSP-SX-05

INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

Table 1

DMSP 5D-2/SX Series Missions

The following table includes information about the planned launch dates and experiments for spacecraft in the DMSP 5D-2/SX series. This series is described in a generic manner on pages 130 to 131. When each of these spacecraft is launched, the last "S" in its name is changed to an "F". The symbol "?" in this table means that it is not yet decided whether or not the experiment will be on that satellite.

Spacecraft Series #	S8	S9	S10	S11	S12	S13	S14
Tentative Launch Date	6/85	7/87	3/86	8/88	9/89	3/91	6/92
EXPERIMENTS							
Operational Linescan System (OLS)	X	X	X	X	X	X	X
Microwave Imager (SSM/I)		X	X	X	X	X	X
Ionospheric Plasma Scintillation Monitor (SSI/ES)	X	X	X	X	X	X	X
Precipitating Electron Spectrometer (SSJ/4)	X	X	X	X	X	X	X
Advanced X-Ray Detector (SSB/X)	X	X	X	X	X	X	X
Microwave Temperature Sounder (SSM/T)	X	X	X	X	X	X	X
Magnetometer (SSM)		?		?	?	?	?
Infrared Temperature and Moisture Sounder (SSH-2)	X	?					

PERSONNEL
PI - AFGWC STAFF GLOBAL WEATHER CTR

BRIEF DESCRIPTION
The microwave temperature sounder, SSM/T, is a seven-channel scanning radiometer which measures radiation in the 5- to 6-mm wavelength (50- to 60-GHz) region (specifically 50.5, 53.2, 54.35, 57.9, 58.4, 58.825, and 59.4 GHz) to provide data on the vertical temperature profile from the earth's surface to above 30 km. The SSM/T operates in the absorption band of molecular oxygen. By choosing frequencies with different absorption coefficients on the wing of the oxygen absorption band, a series of weighting functions peaking at preselected altitudes is obtained. The radiometer scans across the nadir track on seven scan positions and two calibration positions (cold sky and 300 deg K). The dwell time for the crosstrack and calibration positions is 2.7 s each. The total scan period is 32 s. The instrument has an instantaneous field of view of 12 deg and scans to plus or minus 36 deg from the nadir.

------- DMSP 5D-2/SX, AFGWC STAFF------------------------------

INVESTIGATION NAME- MAGNETOMETER (SSM)

NSSDC ID- DMSP-SX-06 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - AFGWC STAFF USAF GEOPHYS LAB

BRIEF DESCRIPTION
The primary purpose of the magnetometer experiment is to obtain the components of magnetic field transverse to the main geomagnetic field at high latitudes which are associated with auroral field-aligned currents. The instrument consists of (1) a triaxial fluxgate magnetometer with a fixed Z-axis sensor and adjustable X- and Y-axis sensors and (2) a signal processor to provide data at a 15-nT resolution in the range 0 to 60,000 nT.

------- DMSP 5D-2/SX, AFGWC STAFF------------------------------

INVESTIGATION NAME- INFRARED TEMPERATURE AND MOISTURE SOUNDER (SSH-2)

NSSDC ID- DMSP-SX-07 INVESTIGATIVE PROGRAM
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - AFGWC STAFF GLOBAL WEATHER CTR

BRIEF DESCRIPTION
The objective of this experiment is to obtain vertical temperature and water vapor profiles of the atmosphere at altitudes from 0 to 30 km. The infrared temperature and moisture sounder, SSH-2, is a 16-channel sensor with one channel (3.7 micrometers) in the 3.7-micrometer window, one channel (11.1 micrometers) in the 12-micrometer window, six channels (13.4, 13.7, 14.1, 14.4, 14.8, 15.0 micrometers) in the 15-micrometer CO2 absorption band, and eight channels (12.5, 18.7, 20.1, 22.7, 23.9, 24.5, 25.2, 28.3 micrometers) in the 22- to 30-micrometer rotational water-vapor absorption band. The experiment consists of an optical system, detector and associated electronics, and a scanning mirror. The scanning mirror is stepped across the satellite ground track, allowing the sounder to view 25 separate columns of the atmosphere every 32 s over a cross-track ground swath of 2204 km. While the scanning mirror is stopped at each of the 25 positions, the channel filters are sequenced through the field of view. The cross-track surface resolution is approximately 60 km at nadir. The radiance data are transformed into temperature and water vapor profiles by a mathematical inversion technique. The rms error of the temperature is 2.5 to 3 deg K.

------- DMSP 5D-2/SX, HENDEL-----------------------------------

INVESTIGATION NAME- ADVANCED X-RAY DETECTOR (SSB/X)

NSSDC ID- DMSP SX-08 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
AERONOMY
PARTICLES AND FIELDS

PERSONNEL
PI - G. HENDEL USAF SPACE DIVISION

BRIEF DESCRIPTION
The primary function of this investigation is to detect nuclear debris from nuclear detonations. The advanced X-ray detector, SSB/X, consists of two nonscanning sensors, one of which looks to the left and the other to the right of the ground track. Each sensor is a set of CdTe detectors which sense X rays in the three energy bands, >60 keV, >150 keV, and >375 keV.

------- DMSP 5D-2/SX, ROTHWELL---------------------------------

INVESTIGATION NAME- PRECIPITATING ELECTRON/ION SPECTROMETER (SSJ/4)

NSSDC ID- DMSP-SX-04 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS

PERSONNEL
PI - P.L. ROTHWELL USAF GEOPHYS LAB

BRIEF DESCRIPTION
The purpose of the precipitating electron/ion spectrometer is to measure fluxes and energies of electrons and ions precipitated into the upper atmosphere. Particles are separated by an electrostatic analyzer into 20 energy bands from 30 eV to 30 keV: (1) 10 high-energy levels, 0.948, 1.39, 2.04, 3.00, 4.40, 6.46, 9.48, 13.92, 20.44 and 30.00 keV; and (2) 10 low-energy levels, 30.0, 44.0, 64.6, 94.9, 139.2, 204.4, 300, 440, 646, and 948 eV. Channeltrons are used to count the impinging electrons and ions in each energy band with particle flux accuracies of 1% and energy flux accuracies of 3.5%.

------- DMSP 5D-2/SX, SAGALYN----------------------------------

INVESTIGATION NAME- IONOSPHERIC PLASMA SCINTILLATION MONITOR (SSI/ES)

NSSDC ID- DMSP-SX-03 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS

PERSONNEL
PI - R.C. SAGALYN USAF GEOPHYS LAB

BRIEF DESCRIPTION
The primary purpose of the ionospheric/scintillation monitor, SSI/ES, is to measure electron density and temperature, hydrogen and oxygen ion density and temperature, the power spectrum of plasma irregularities, and the velocity components of bulk plasma flow at satellite altitude. The experiment consists of one boom-mounted electrostatic analyzer and three different body-mounted planar electrostatic ion traps (Langmuir probes); the three ion traps are used as a retarding potential analyzer, a driftmeter, and a scintillation monitor, respectively. The electrostatic analyzer measures electron parameters at least 1 m above the satellite surface. The ion retarding potential analyzer has an ion trap with a circular aperture to measure the density of ions from 1 to 16 u and ion temperature in the range 500 to 10,000 deg K. The driftmeter uses an ion trap with a four-quadrant collector. The current is measured in pairs of quadrants and differenced to provide plasma drift velocities. The scintillation monitor obtains power spectrum irregularities by an ion trap with electrometer and amplifiers capable of measuring direct current and alternating current in the frequency range 20 Hz to 12 kHz.

****************************** EOM-A ******************************

SPACECRAFT COMMON NAME- EOM-A
ALTERNATE NAMES- EARTH OBSERV. MISSION 1, EOM-1

NSSDC ID- EOM-A

LAUNCH DATE- 11/00/85 WEIGHT- KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA
IASB
CNES
DFVLR
ISAS

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 90.4 MIN INCLINATION- 57.0 DEG
PERIAPSIS- 296. KM ALT APOAPSIS- 296. KM ALT

PERSONNEL
MM - G. WICKS NASA-MSFC
MS - D. REASONER NASA-MSFC

BRIEF DESCRIPTION
The Earth Observation Mission-A (EOM-A) is the first of a series of missions dedicated to measuring the makeup of the earth's middle and upper atmosphere and the variations in the sun's output during an 11-year solar cycle. EOM-A has a payload consisting of nine of the Spacelab-1 experiments, with only minor changes in two of these experiments. Later EOM flights will have added experiments. The EOM-A payload is flown into space and returned inside the payload compartment of the Space Shuttle Orbiter. While in space, the Orbiter payload compartment doors are opened to allow viewing of the earth,

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sun, and deep space. EOM-A is a multidiscipline mission with experiments in three general areas of investigation: (1) three experiments in the area of Atmospheric Physics and Earth Observations, (2) two experiments in the area of Space Plasma Physics, and (3) four experiments in the area of Astronomy and Solar Physics.

------- EOM-A, ACKERMAN---------------------------------------

INVESTIGATION NAME- GRILLE SPECTROMETER

NSSDC ID- EOM-A -01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL
PI - M. ACKERMAN IASB

BRIEF DESCRIPTION
The experiment objective is to determine the vertical distribution profiles of trace constituents in the stratosphere, mesosphere, and thermosphere in order to study chemical and dynamical atmospheric processes, on a global scale, between 15- and 150-km altitude. The equipment contains an infrared spectrometer with a telescope and a cooled infrared detector. The spectrometer operates in the wavelength range from 2.5 to 13 micrometers. The experiment can measure carbon dioxide in the thermosphere and water and methane in the mesosphere. Solar absorption spectra of the earth's atmospheric limb can be taken at sunset and sunrise in infrared light with a spectral resolution better than 0.1 per cm.

------- EOM-A, BOWYER---------------------------------------

INVESTIGATION NAME- FAR UV ASTRONOMY USING THE FAUST TELESCOPE

NSSDC ID- EOM-A -02 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL
PI - C.S. BOWYER U OF CALIF, BERKELEY
CI - G.C. COURTES CNRS-LAS
CI - R. MALINA U OF CALIF, BERKELEY

BRIEF DESCRIPTION
The experiment objective is to observe UV stars and other faint astronomical sources in the 110- to 200-nm band. The equipment consists of a far ultraviolet space telescope (FAUST) and an electronic interface module. The FAUST is an f/1.12 Wynne camera with an effective collecting area of 150 sq cm and a field of view of 7.5 deg. The imaging capability is better than 2 arc-min in the entire field of view. The detector system uses a microchannel plate plus a position-sensitive wedge and strip anode to convert images to electronic pixel information.

------- EOM-A, CROMMELYNCK---------------------------------------

INVESTIGATION NAME- ABSOLUTE MEASUREMENT OF THE SOLAR CONSTANT

NSSDC ID- EOM-A -03 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - D. CROMMELYNCK ROYAL METEOR.INST BELG
CI - V. DOMINGO ESA-ESTEC

BRIEF DESCRIPTION
The experiment objectives are (1) to measure the absolute value of the solar constant to 0.1% accuracy using a self-calibrating radiometer, and (2) to measure any long-term variations in the solar constant. The equipment consists of an absolute radiometer with a built-in stability check. This radiometer has two channels which enable any degradation of the black surfaces to be detected and compensated. The radiation measurements are made by using a heat balance system which is driven automatically by a feedback system. The instrument has a sensitivity of better than 0.05%.

------- EOM-A, LANGNER---------------------------------------

INVESTIGATION NAME- METRIC CAMERA EXPERIMENT

NSSDC ID- EOM-A -06 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL
PI - A. LANGNER DFVLR
CI - M. SCHROEDER DFVLR

BRIEF DESCRIPTION
The purpose of the metric camera experiment is to test the mapping capabilities of high-resolution photography from space. The experiment uses a Zeiss RMK A30/23 aerial survey camera and a Skylab optical window with the following characteristics: f = 305 mm; f-stops available (f/5.6, f/8, f/11); shutter speeds (1/100, 1/250, 1/500, and 1/1000 s); negative size (23 cm x 23 cm [length for 550 photos per magazine]); angle of field (56 deg); and ground resolution (20 m). Black-and-white, color, and color IR film can be used. To get 80% longitudinal overlap of subsequent photographs at a Shuttle velocity of 7.7 km/s, there is a time interval of about 5 s between two successive exposures. Strips 1800 to 2300 km long can be covered on the ground in each sequence.

------- EOM-A, MENDE---------------------------------------

INVESTIGATION NAME- ATMOSPHERIC EMISSION PHOTOMETRIC IMAGING

NSSDC ID- EOM-A -04 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
ATMOSPHERIC PHYSICS
UPPER ATMOSPHERE RESEARCH

PERSONNEL
PI - S.B. MENDE LOCKHEED PALO ALTO
CI - K.S. CLIFTON NASA-MSFC
CI - G.R. SWENSON LOCKHEED PALO ALTO

BRIEF DESCRIPTION
The experiment objectives are (1) to investigate upper atmospheric transport processes through the measurement of resonant scattered emissions from positive magnesium ions, (2) to measure excitation cross sections of upper atmospheric constituents using injected particle beams and detection of the resulting emissions, (3) to investigate atmospheric composition and energy budget through observations of natural aurora, (4) to observe large- and small-scale auroral morphology and compare ultraviolet and visible auroral features, (5) to support the electron accelerator in conducting measurements of magnetospheric electric fields, and (6) to measure small particulate contamination around the Shuttle. The equipment consists of (1) a dual-channel video system with associated optics and data handling electronics mounted on a stabilized platform for pointing and control, (2) a secondary electron conduction (SEC) vidicon detector for high-sensitivity, high-resolution operation, (3) a low-resolution microchannel plate array detector operating in a photon counting mode, (4) command and data management systems, and (5) onboard recorders utilized for data display and recording. The magnesium positive ion resonance line is imaged at 279.5 and 280.2 nm. For the study of the 2p state of singly ionized atomic oxygen, simultaneous sensing at 731.9 and 247.0 nm is obtained.

------- EOM-A, OBAYASHI---------------------------------------

INVESTIGATION NAME- SPACE EXPERIMENTS WITH PARTICLE ACCELERATORS (SEPAC)

NSSDC ID- EOM-A -05 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES
AERONOMY

PERSONNEL
PI - T. OBAYASHI ISAS, U OF TOKYO
CI - J.L. BURCH SOUTHWEST RES INST
CI - W.T. ROBERTS NASA-MSFC
CI - W.W.L.TAYLOR TRW SYSTEMS GROUP

BRIEF DESCRIPTION
The experiment objectives are to carry out active and interactive perturbation experiments in the earth's ionosphere to study (1) auroral production in the upper atmosphere; (2) ionospheric parameters such as anomalous resistivity, plasma coupling processes, electric and magnetic field morphology, vehicle charge neutralization, Shuttle/payload-induced environments, electron beam/neutral-plume interaction, and the coupling between the earth's atmosphere and magnetosphere; and (3) the effects of particle interactions on atmospheric dynamics. The equipment consists of an electron beam accelerator, magneto-plasma-dynamic (MPD) arcjet, battery/capacitor bank to provide high discharge current, monitor and diagnostic devices, and control, display, and data management systems. The electron beam accelerator, MPD arcjet, and neutral gas ejector are contained in the accelerator subsystem. The electron beam accelerator is capable of operating at voltages from 1 to 7.5 kV at a maximum of 1.5 A and with a variable pulse width of from 10 ms to 1 s. The MPD arcjet uses argon gas and has an energy input of 2 kJ per pulse. The third accelerator component is a neutral gas plume generator which uses nitrogen as the gas.

------- EOM-A, THUILLIER--

INVESTIGATION NAME- MEASUREMENT OF THE SOLAR SPECTRUM FROM 170 TO 3200 NANOMETERS

NSSDC ID- EOM-A -07 INVESTIGATIVE PROGRAM CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S) SOLAR PHYSICS

PERSONNEL
PI - G. THUILLIER CNRS-SA
PI - P.C. SIMON IASB
CI - M. HERSE CNRS-SA

BRIEF DESCRIPTION
The experiment objective is to measure the solar spectral irradiance between 170 and 3200 nm with an accuracy of 0.1% in order to determine the solar constant, variations in the solar constant with solar cycle using Space Shuttle flights over a 10-yr period, and variations of irradiance within each spectral region. The equipment consists of three grating spectrometers covering the UV (170 to 370 nm), visible (350 to 900 nm), and IR (800 to 3200 nm) spectral regions.

------- EOM-A, TORR--

INVESTIGATION NAME- AN IMAGING SPECTROMETRIC OBSERVATORY

NSSDC ID- EOM-A -08 INVESTIGATIVE PROGRAM CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S) ATMOSPHERIC PHYSICS

PERSONNEL
PI - M.R. TORR UTAH STATE U

BRIEF DESCRIPTION
The experiment objectives are (1) to obtain daytime measurements of the airglow spectrum from the extreme ultraviolet to the infrared (20 to 1200 nm), and (2) to monitor the Shuttle-induced contamination. It is planned to measure emissions from a large range of minor constituents, metastable and excited species of both atomic and molecular ions, and neutrals in the atmosphere (ranging from the stratosphere to the upper thermosphere). The flight instrument, which is designed for high-speed operation as an imaging device, is composed of five identical spectrometers, each of which is restricted to a given spectral range within the 20- to 1200-nm region. Each module is an imaging scanning spectrometer with coincident 0.5- x 0.007-deg fields of view. Imaging capability is obtained along the length of the observational field by use of an area array detector comprising 190 x 244 elements. Thus, a single measurement produces adjacent spectra in a given module obtained from adjacent observational fields. Wavelength resolution varies between 0.2 and 0.6 nm over the spectral range. A scan mirror is used, and a single exposure at one scan position covers a 250-nm region. The telescope is baffled and has several operating modes.

------- EOM-A, WILLSON--

INVESTIGATION NAME- ACTIVE CAVITY RADIOMETER SOLAR IRRADIANCE MONITOR

NSSDC ID- EOM-A -09 INVESTIGATIVE PROGRAM CODE EZ

INVESTIGATION DISCIPLINE(S) SOLAR PHYSICS

PERSONNEL
PI - R.C. WILLSON NASA-JPL

BRIEF DESCRIPTION
The objective of the active-cavity radiometer irradiance monitor experiment is to measure the total solar irradiance with state-of-the-art accuracy and precision. The solar irradiance from far ultraviolet through far infrared wavelengths is measured by three type-V, active-cavity radiometer detectors. These detectors are electrically self-calibrated, cavity pyrheliometers each capable of defining the absolute radiation scale with an uncertainty of plus or minus 0.1%. The three detectors are independently shuttered and their cycles of operation are different. The three detectors are used in various combinations to provide periodic cross references on the system's performance.

*************************** EUVE ***************************

SPACECRAFT COMMON NAME- EUVE
ALTERNATE NAMES- EXTREME UV EXPLORER, BERKSAT

NSSDC ID- EUVE

LAUNCH DATE- 02/00/89 WEIGHT- 400. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 95.0 MIN INCLINATION- 28.5 DEG
PERIAPSIS- 550. KM ALT APOAPSIS- 550. KM ALT

PERSONNEL
MG - M.B. WEINREB NASA HEADQUARTERS
SC - E.J. WEILER NASA HEADQUARTERS
PM - R.A. PLOSZAJ NASA-JPL
PS - C.S. BOWYER U OF CALIF, BERKELEY

BRIEF DESCRIPTION
Extreme-Ultraviolet Explorer (EUVE) is a spinning spacecraft designed to rotate about the earth/sun line. The spacecraft objective is to carry out a full-sky survey in the extreme ultraviolet (EUV) range of the spectrum, from 100 to 1000 A, for the purpose of discovering and studying UV sources radiating in this region and for analyzing effects of the interstellar medium on the radiation from these sources. The search is accomplished by three EUV telescopes, each sensitive to a different band within the EUV range. A fourth telescope performs a high sensitivity search of a limited sample of the sky in a single EUV band. In 6 months, the entire sky is scanned at a sensitivity level comparable to existing surveys in other more traditional astronomical bandpasses. A moderate resolution spectroscopy option covers the band from 80 to 600 A and provides spectra of at least the 10? brightest EUV sources. It is used by guest observers.

------- EUVE, BOWYER--

INVESTIGATION NAME- EXTREME ULTRAVIOLET FULL-SKY SURVEY

NSSDC ID- EUVE -01 INVESTIGATIVE PROGRAM CODE EZ

INVESTIGATION DISCIPLINE(S) ASTRONOMY

PERSONNEL
PI - C.S. BOWYER U OF CALIF, BERKELEY
OI - R. MALINA U OF CALIF, BERKELEY
OI - M. LAMPTON U OF CALIF, BERKELEY
OI - H. HEETDERKS U OF CALIF, BERKELEY
OI - D. LANGLEY U OF CALIF, BERKELEY

BRIEF DESCRIPTION
This investigation is designed to perform a full-sky survey, searching for EUV sources. The instrument package contains four Wolter-Schwarzschild grazing-incidence telescopes (with EUV thin-film filters) to collect and to isolate radiation. The detector system for each telescope is a wedge and strip anode image converter, consisting of a microchannel plate, a wedge and strip anode, and detector amplifiers designed to produce images of sky fields in selected wavelength ranges. Three telescopes are designed to operate at right angles to the spin axis and to carry out the sky survey, with bandpass filters (tentatively) for the wavelength ranges 80 to 190 A, 170 to 330 A, and 500 to 750 A. These three telescopes point perpendicular to the earth-sun line and sweep out a great circle in the sky with each S/C revolution. As the earth moves around the sun, the great circle is shifted by 1 deg each day and so the entire celestial sphere is surveyed in 6 months. The fourth telescope points in the anti-solar direction, within the earth's shadow cone. In this limited direction, the He II 304 A background is almost completely absent, and thus higher sensitivity can be obtained for observing selected interesting objects. Spectroscopic observations of the brightest EUV sources are carried out with a resolving power of 100 from 80 to 800 A.

*************************** GALILEO ORBITER ***************************

SPACECRAFT COMMON NAME- GALILEO ORBITER
ALTERNATE NAMES- JUPITER ORBITER PROBE, JOP
GALILEO

NSSDC ID- JOPO

LAUNCH DATE- 05/30/86 WEIGHT- 103. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- JUPITER ORBITER
ORBIT PERIOD- 86000. MIN INCLINATION- 0.0 DEG
PERIAPSIS- 320000. KM ALT APOAPSIS- 1.95E+7 KM ALT

PERSONNEL
MG - D.R. MCCULLAR NASA HEADQUARTERS
SC - R.E. MURPHY NASA HEADQUARTERS
PM - J.R. CASANI NASA-JPL
PM - W.S. SHIPLEY NASA-JPL
PS - T.V. JOHNSON NASA-JPL

NSSDC ID- GIOTTO -01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
INTERPLANETARY PHYSICS

PERSONNEL

PI - H.U.	KELLER	MPI-AERONOMY
OI - R.M.	BONNET	ESA
OI - C.B.	COSMOVICI	DFVLR
OI - W.A.	DELAMERE	BALL AEROSPACE SYS DIV
OI - C.	JAMAR	INST D'ASTROPHYSIQUE
OI - C.	BARBIERI	INST DI ASTRONOMIA
OI - C.	ARPIGNY	INST D'ASTROPHYSIQUE
OI - L.F.B.	BIERMANN	MPI-EXTRATERR PHYS
OI - G.	COLOMBO	U OF PADOVA
OI - W.F.	HUEBNER	LOS ALAMOS SCI LAB
OI - D.W.	HUGHES	U OF SHEFFIELD
OI - F.L.	WHIPPLE	HARVARD COLLEGE OBS
OI - W.K.H.	SCHMIDT	MPI-AERONOMY
OI - K.	WILHELM	MPI-AERONOMY
OI - D.	MALAISE	INST D'ASTROPHYSIQUE
OI - S.	CAZES	CNRS-LPSP
OI - P.	BENVENUTI	INST DI ASTRONOMIA
OI - P.	SEIGE	DFVLR

BRIEF DESCRIPTION

The Halley Multicolor Camera (HMC) is designed to provide high-resolution images of the nucleus and the coma of Halley's comet in nine colors and two polarizations. The camera operates in a spin-scan mode and uses a 1-m focal length Ritchey-Chretien telescope with an effective f number of 7.68. The instanteous field of view is 1.5 deg with no vignetting and the whole sphere can be viewed using rotation of the camera, tilting of the 45-deg deflecting mirror, and the spacecraft spin. The entrance collimator is at 90 deg with respect to the telescope axis of symmetry, which is the axis of rotation for the whole system. The light is deflected by 90 deg by a mirror that can be adjusted by about 1 deg about an axis perpendicular to the plane of symmetry of the telescope. The sensors are two area charge-coupled devices (CCD) and one Reticon. The CCDs have two segments each that provide 390 x 292 pixels while the Reticon has 2 x 936 pixels. The pixel size in micrometers is 22.3 x 22.3 for the CCDs and 30 x 375 for the Reticon. The spectral response of the whole system is about 350 to 1100 nm and a filter wheel is used to obtain 4 bands simultaneously for color and polarization or 11 broad and narrow bands alternately. The resolution in observing the comet is 11 m/pixel at a slant range of 500 km.

------- GIOTTO, KISSEL---

INVESTIGATION NAME- DUST IMPACT MASS SPECTROMETER (PIA)

NSSDC ID- GIOTTO -04 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
DUST

PERSONNEL

PI - J.	KISSEL	MPI-NUCLEAR PHYS
OI - Z.	SEKANINA	NASA-JPL
OI - N.G.	UTTERBACK	NASA-JPL
OI - B.C.	CLARK	MARTIN-MARIETTA AEROSP
OI - H.A.	ZOOK	NASA-JSC
OI - H.	FECHTIG	MPI-NUCLEAR PHYS
OI - E.	GRUN	MPI-NUCLEAR PHYS
OI - H.J.	VOELK	MPI-NUCLEAR PHYS
OI - E.K.	JESSBERGER	MPI-NUCLEAR PHYS
OI - F.R.	KRUEGER	MPI-NUCLEAR PHYS
OI - J.A.M.	MCDONNELL	U OF KENT, CANTERBURY
OI - G.H.	SCHWEHM	RUHR-U BOCHUM
OI - G.E.	MORFILL	MPI-PHYS/ASTROPHYS
OI - J.	RAHE	BAMBERG OBSERVATORY
OI - E.B.	IGENBERGS	TECH U OF MUNICH
OI - K.	KORNUNG	U AT MUNICH-NEUBIBERG

BRIEF DESCRIPTION

The objective of this investigation is to determine the chemical and physical properties of the dust particles released by Comet Halley. The instrument is a redesign of the one flown on Helios-A and -B by Fechtig and colleagues. The chemical composition and the mass of individual particles are measured. The impact count as a function of the position relative to the comet's nucleus provides the mass distribution and the rate of production of dust. The measurements should provide (1) the elemental abundance of individual particles, (2) compositional distribution around the comet, and (3) determination of specific isotopic ratios, such as 6Li/7Li, 10B/11B, or 12C/13C. The instrument consists of (1) an adjustable entrance port, (2) a target of atomic mass >105, (3) a set of acceleration grids, (4) a two-section time-of-flight drift tube, (5) an ion reflector chamber, and an electron multiplier tube. The particles are measured by the charge of the impact plasma, the impact light flash, and mass dispersion through the time-of-flight tube. Calibration with a ground-based dust accelerator is imperative to the interpretation of the data. The instrument handles an impact rate up to 100/s, which is controlled by the variable entrance port (1 - 500 sq mm) under microprocessor control and covers the particle mass range from 3.E-16 to 5.E-10 g. The mass resolution M/delta M is 200 at 100 u and the dynamic range that can be handled in one mass spectrum is 1.E3. Additional detail for this instrument can be found in "The Particulate Impact Analyzer, an Instrument to Analyze Small Particles Released by Halley's Comet" by J. Kissel, ESA SP-169, June 1981.

------- GIOTTO, KRANKOWSKY---

INVESTIGATION NAME- NEUTRAL MASS SPECTROMETER (NMS)

NSSDC ID- GIOTTO -02 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL

PI - D.	KRANKOWSKY	MPI-NUCLEAR PHYS
OI - P.	LAMMERZAHL	MPI-NUCLEAR PHYS
OI - P.X.	EBERHARDT	U OF BERNE
OI - U.	HERRMANN	U OF BERNE
OI - J.J.	BERTHELIER	CRPE, CNRS-CNET
OI - J.M	ILLIANO	CNRS-CRPE
OI - J.H.	HOFFMAN	U OF TEXAS, DALLAS
OI - R.R.	HODGES	U OF TEXAS, DALLAS
OI - H.U.	KELLER	MPI-AERONOMY
OI - M.	FESTOU	CNRS-SA

BRIEF DESCRIPTION

The objective of the investigation is to identify the chemical nature of the neutral gas molecules and ionic species in the coma of Comet Halley, and to measure their chemical and isotopic abundances and their velocity distributions. The instrument consists of two sensors: (1) the M-analyzer that will provide direct mass analysis in the range 1-36 u, and (2) the E-analyzer that will provide energy analysis in the range from about 25 eV to 2.1 keV, corresponding to kinetic energies of coma particles with masses between 1 u and 86 u, at the relative probe velocity of 68.7 km/s. The energy analyzer is a parallel plate electrostatic deflector using an extended focal plane detector to cover the entire range in two or three measurements. The mass analyzer is a parallel plate deflector followed by a magnet; this configuration provides double focusing; i.e., suprathermal species having different energies resulting from their motions in the comet frame of reference will still be focused. The detectors are microchannel plates followed by an array of charge-sensitive anodes. Both analyzers cycle between a neutral mode when gas molecules are ionized by electrons bombarding them in a fly-through type source, and an ion mode measuring ambient cometary ions. At greater distance from the nucleus (until 1 h before closest encounter) the experiment provides ion composition and directional analysis, by applying variable deflecting voltages in front of the analyzers. During the close encounter, emphasis is on the neutral gas investigation which includes low ionization energies for the discrimination of fragmentation effects. Repetition periods are in the order of 3 s which gives a spatial resolution of about 200 km.

------- GIOTTO, LEVASSEUR-REGOURD---

INVESTIGATION NAME- HALLEY OPTICAL PROBE (HOPE)

NSSDC ID- GIOTTO -09 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS

PERSONNEL

PI - A.C.	LEVASSEUR-REGOURD	CNRS-SA
OI - J.L.	WEINBERG	U OF FLORIDA
OI - P.	LAMY	CNRS-LAS

BRIEF DESCRIPTION

The optical probe technique is employed in this investigation to determine, unequivocally, changes in the densities of emissive gases (OH, C2, CN, CO+, and CS) and scattering dust, as well as to measure the optical properties of dust, in the coma of Halley's comet. The instrument contains no moving parts and performs photopolarimetric measurements parallel to the direction of motion through the coma. The choice of wavelengths is the following: 368, 444, 575, and 718 nm for dust, and 307, 387, 462, and 514 nm for gases. The rapid motion of the spacecraft allows line-of-sight measurements to be differenced so that the resulting brightnesses and polarizations refer to the small volume of space of about 140 km length centered at the moving probe.

------- GIOTTO, MCDONNELL---

INVESTIGATION NAME- DUST IMPACT DETECTOR (DID)

NSSDC ID- GIOTTO -08 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
DUST

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PERSONNEL
PI - L.A. FRANK — U OF IOWA
OI - F.V. CORONITI — U OF CALIF, LA
OI - V.M. VASYLIUNAS — MPI-AERONOMY

BRIEF DESCRIPTION

The purposes of this investigation are (1) to establish the sources of Jovian plasma; (2) to investigate plasma interactions with the Jovian satellites; (3) to investigate the role of plasma as a source for energetic charged particles in the radiation zones; (4) to determine the nature of the equatorial current sheet; and (5) to evaluate the roles of magnetic merging, co-rotational forces and field-aligned currents in the dynamics of the Jovian magnetosphere. The investigation uses an electrostatic analyzer (quadrispherical LEPEDEA) in determining differential energy spectra of both positive ions and electrons with essentially complete angular coverage in 63 contiguous passbands. The fractional energy resolution is 0.17 and the range is 1 eV to 50 keV. Three miniature mass spectrometers at the analyzer exit aperture are used for mass analysis, with a fractional mass resolution of 0.18, sufficient to identify H+, He+, He++, Na+, K+, and S+. The analyzer is mounted on a short boom on the spinning section of the Orbiter. The total mass (excluding the boom) is 6.9 kg, and the total power is 7.2 W.

------- GALILEO ORBITER, GIERASCH------------------------------

INVESTIGATION NAME- JOVIAN ATMOSPHERIC DYNAMICS (IDS)

NSSDC ID- JOPO -13 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL
PI - P.J. GIERASCH — CORNELL U

BRIEF DESCRIPTION

The objective of this investigation is to utilize data from the imaging and near-infrared mapping spectroscopy investigations on the Orbiter, together with in situ atmospheric data from the Probe, to study the dynamics of the atmosphere, with particular emphasis on the nature and cause of the horizontal temperature gradients beneath the clouds.

------- GALILEO ORBITER, GRUN---------------------------------

INVESTIGATION NAME- PHYSICS AND DYNAMICS OF DUST (DDS)

NSSDC ID- JOPO -09 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST
PARTICLES AND FIELDS

PERSONNEL
PI - E. GRUN — MPI-NUCLEAR PHYS
OI - H. FECHTIG — MPI-NUCLEAR PHYS
OI - J. KISSEL — MPI-NUCLEAR PHYS
OI - B.A. LINDBLAD — LUND OBS
OI - G.E. MORFILL — MPI-PHYS/ASTROPHYS
OI - H.A. ZOOK — NASA-JSC
OI - M.S. HANNER — NASA-JPL

BRIEF DESCRIPTION

The purpose of this investigation is to determine the physical and dynamical properties of small dust particles in the Jovian environment, with emphasis on the interaction of dust with the magnetosphere and satellite surfaces. Parameters measured include mass, direction of motion, and charge. The instrument package consists of entrance grids for sensing charge, an impact plasma detector to measure pulse height and rise time for both electrons and ions generated by impact, and appropriate electronics. Mass and velocity are derived from measurements by empirical relationships determined in ground-based calibrations. The impact rate range is 1.E-7 to 1.E+2 per second, the particle mass range is 1.E-16 to 1.E-6 g, and the charge range is 1.E-14 to 1.E-10 C. The instrument package is mounted on the spinning section of the Orbiter. Its total mass is 4.2 kg, and the total power is 1.7 W.

------- GALILEO ORBITER, GURNETT------------------------------

INVESTIGATION NAME- PLASMA WAVE SCIENCE (PWS)

NSSDC ID- JOPO -07 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - D.A. GURNETT — U OF IOWA
OI - R.E. GENDRIN — CNET
OI - C.F. KENNEL — U OF CALIF, LA
OI - F.L. SCARF — TRW SYSTEMS GROUP
OI - S.D. SHAWHAN — U OF IOWA

BRIEF DESCRIPTION

The purposes of this investigation are to measure the varying electric and magnetic fields in the Jovian plasma in order to determine the characteristics and origin of plasma waves in the magnetosphere and to analyze various wave-particle interaction phenomena in the magnetospheric interactions. The instrument package includes a 2-m electric dipole antenna for electric field measurement and two 27-cm search coil magnetometers, one for low-frequency (less than 10 kHz) and the other for high-frequency magnetic field measurements. There is also a 20-channel spectrum analyzer covering the range 5.6 Hz to 311 kHz, with 4 channels per decade and a high-data-rate waveform receiver to be used during selected periods. Sensors are mounted as a single unit in a boom approximately 2 m long on the spinning section of the Orbiter. Electronics are mounted near the base of the boom. The total mass of the package is 3.1 kg (1.2 kg for the sensors and 1.9 kg for electronics). The total power is 2.8 W.

------- GALILEO ORBITER, HANSEN-------------------------------

INVESTIGATION NAME- PHOTOPOLARIMETERY/RADIOMETER (PPR)

NSSDC ID- JOPO -08 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
PLANETARY ATMOSPHERES

PERSONNEL
PI - J.E. HANSEN — NASA-GISS
OI - A.A. LACIS — NASA-GISS
OI - G.S. ORTON — NASA-JPL
OI - P.H. STONE — MASS INST OF TECH
OI - L. TRAVIS — NASA-GISS
OI - Y.L. YUNG — CALIF INST OF TECH

BRIEF DESCRIPTION

The purposes of the Photopolarimeter Radiometer (PPR) investigation are to determine the cloud and haze properties (vertical and horizontal distribution and microstructure) and radiation budget (including vertical profile of solar heating) of Jupiter and to investigate the photometric and thermal properties of satellite surfaces. The instrument is a 10-cm Dall-Kirkham telescope followed by a 16-position filter wheel, giving polarimetry in three spectral bands from 410 to 1050 nm and photometry in seven spectral bands from 560 to 890 nm. Silicon photodiodes are used for photopolarimetry and a thermopile detector for radiometry. Measurement accuracy is 0.1% absolute polarimetry; 1% relative photometry and 3% absolute photometry; 1% relative radiometry and 5% absolute radiometry. The instrument is mounted on the Orbiter scan platform. The total mass is 3.6 kg and the total power is 7.5 W.

------- GALILEO ORBITER, HORD---------------------------------

INVESTIGATION NAME- ULTRAVIOLET SPECTROSCOPY (UVS)

NSSDC ID- JOPO -02 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL
PI - C.W. HORD — U OF COLORADO
OI - C.A. BARTH — U OF COLORADO
OI - A.L. LANE — NASA-JPL
OI - A.I. STEWART — U OF COLORADO
OI - G.E. THOMAS — U OF COLORADO

BRIEF DESCRIPTION

This investigation studies (1) the composition and structure of the high neutral atmospheres of Jupiter and the Galilean satellites to determine atmospheric loss rates from satellites, (2) mixing ratios on Jupiter of NH3 and of UV-active trace constituents, and (3) auroral emissions and interactions between atmospheres and the Jovian plasmasphere. Instrumentation consists of a Fastie-Ebert UV spectrometer (wavelength range of 110 to 430 nm) with a Cassegrain telescope having a 5-cm aperture, 25-cm focal length, and a programmable grating. The spectrum is measured with microchannel detectors providing resolution of 1.8 km at periapsis. The spectrometer is mounted on the Orbiter scan platform and has a total mass of 3.4 kg. The total power is 4.2 W.

------- GALILEO ORBITER, HOWARD-------------------------------

INVESTIGATION NAME- RADIO PROPAGATION

NSSDC ID- JOPO -27 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
RADIO PHYSICS
CELESTIAL MECHANICS

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PERSONNEL
PI - H.T. HOWARD STANFORD U

BRIEF DESCRIPTION
The purpose of this experiment is to study the structure of the atmospheres and ionospheres of Jupiter and its satellites. This can be accomplished through the use of the radio signals from both the Probe and the spinning section of the Orbiter.

------- GALILEO ORBITER, HUNTEN-------------------------------

INVESTIGATION NAME- STRUCTURE AND AERONOMY OF THE JOVIAN AND SATELLITE ATMOSPHERES (IDS)

NSSDC ID- JOPO -14 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL
PI - D.M. HUNTEN U OF ARIZONA

BRIEF DESCRIPTION
The objectives of this investigation are to study the heat balance of Jupiter's atmosphere, to estimate the eddy diffusion coefficients in the atmosphere, and to study the aeronomy of neutral and ionized atmospheres (including those of the satellites) by using data from a wide variety of Probe and Orbiter instruments.

------- GALILEO ORBITER, INGERSOLL-------------------------------

INVESTIGATION NAME- HIGH RESOLUTION STUDY OF WINDS, TEMPERATURES AND CLOUDS

NSSDC ID- JOPO -28 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL
PI - A.P. INGERSOLL CALIF INST OF TECH

BRIEF DESCRIPTION
This investigation uses the scan platform instruments (SSI, photopolarimeter radiometer, near infrared mapping spectroscopy) of the Galileo orbiter to infer the horizontal fields of wind, temperature, and cloud amount on scales of 1000 km and smaller. The maximum possible resolution of the instruments obtainable when the spacecraft is near perijove will be used to achieve this objective. Repeated coverage of the same area is also necessary. Although the SSI imaging resolution may reach 20 km, the scale with which one can infer the wind field is much broader, and is determined by the spacing of observable features. From the observed wind, temperature, and cloud fields, one can infer the horizontal transports of heat, momentum, and cloud particles. One can also estimate the eddy diffusion coefficient and assess the role of small scale processes (convective eddies, shears, turbulence, etc.) in the large-scale circulation.

------- GALILEO ORBITER, KIVELSON-------------------------------

INVESTIGATION NAME- MAGNETOMETER (MAG)

NSSDC ID- JOPO -03 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
PLANETOLOGY
MAGNETOSPHERIC PHYSICS
IONOSPHERES

PERSONNEL
PI - M.G. KIVELSON U OF CALIF, LA
OI - P.J. COLEMAN, JR. U OF CALIF, LA
OI - C.F. KENNEL U OF CALIF, LA
OI - R.L. MCPHERRON U OF CALIF, LA
OI - C.T. RUSSELL U OF CALIF, LA

BRIEF DESCRIPTION
The purposes of this investigation are to study the Jovian magnetic field in order to map the configuration of the magnetosphere and analyze its dynamics, investigate magnetospheric-ionospheric coupling, measure magnetic fluctuations, search for magnetic fields on the satellites, and investigate the properties of the satellites and their interactions with the ambient medium. The instrument package includes dual triaxial fluxgate magnetometers with a dynamic range of 0.0025 to 1.6E4 nT, mounted on a boom on the spinning part of the Orbiter spacecraft. Each sensor triad can be mechanically flipped about the boom axis. Outboard sensors are wound for low field readings of 0.001 nT to 512 nT, inboard sensors for high field readings of 0.031 nT to 1.6E4 nT. Electronics are mounted on the spinning section and include optimum averaging capability. The mass, excluding the boom, is 3.2 kg (1.0 for the sensors, 2.2 for the electronics). The total power is 3.7 W.

------- GALILEO ORBITER, MASURSKY-------------------------------

INVESTIGATION NAME- GEOLOGY OF THE GALILEAN SATELLITES (IDS)

NSSDC ID- JOPO -15 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY

PERSONNEL
PI - H. MASURSKY US GEOLOGICAL SURVEY

BRIEF DESCRIPTION
The objective of this investigation is to use Orbiter imaging and near infrared mapping spectroscopy data to investigate geological processes on the Galilean satellites, with emphasis on the identification and distribution of surface materials, the morphologies and densities of impact craters, and the search for structure indicative of glacial and periglacial processes.

------- GALILEO ORBITER, MCELROY-------------------------------

INVESTIGATION NAME- JOVIAN UPPER ATMOSPHERE AND SATELLITE ATMOSPHERES (IDS)

NSSDC ID- JOPO -16 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL
PI - M.B. MCELROY HARVARD U

BRIEF DESCRIPTION
This investigation uses data from a variety of Probe and Orbiter investigations to study the composition and structure of planetary and satellite atmospheres, with emphasis on photochemistry and interaction of the atmospheres with the magnetosphere.

------- GALILEO ORBITER, MORRISON-------------------------------

INVESTIGATION NAME- PHYSICAL PROPERTIES OF GALILEAN SATELLITES (IDS)

NSSDC ID- JOPO -25 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY

PERSONNEL
PI - D. MORRISON U OF HAWAII

BRIEF DESCRIPTION
The objectives of this experiment are to utilize data from the imaging, photopolarimeter/radiometer, near infrared mapping spectrometer, and dust detector investigations in order to study the physical nature of the satellites and their regoliths. Emphasis will be on radiometric temperatures and surface thermal properties and on the sources and sinks of dust in the satellite system. These studies should clarify the nature of the surface material and indicate the internal and external processes that determine its physical properties. Extension of these interpretations can then be made to improve the utility of other remote-sensing observations of satellites, asteroids, and comets, made both from earth and from other space missions.

------- GALILEO ORBITER, ORTON-------------------------------

INVESTIGATION NAME- GROUND-TRUTH ANALYSIS OF RADIATIVE TRANSFER IN ATMOSPHERE OF JUPITER (IDS)

NSSDC ID- JOPO -17 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL
PI - G.S. ORTON NASA-JPL

BRIEF DESCRIPTION
The objective of this investigation is to study the structure of the atmosphere of Jupiter using data from the Probe structure, composition, nephelometer, and net-flux radiometer investigations, together with Orbiter photopolarimeter/radiometer and near infrared mapping spectroscopy remote-sensing data. Results include an analysis of radiative equilibrium in the upper troposphere and stratosphere and an assessment of the information required in general for successful remote determination of atmospheric conditions on the outer planets.

------- GALILEO ORBITER, OWEN--------------------------------

INVESTIGATION NAME- COMPOSITION OF THE JOVIAN ATMOSPHERE (IDS)

NSSDC ID- JOPO -18

INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL
PI - T. OWEN STATE U OF NEW YORK

BRIEF DESCRIPTION
This investigation uses in situ data from the mass spectrometer and helium interferometer investigations on the Probe and remote data from the near infrared mapping spectroscopy and other Orbiter investigations to establish a direct calibration of previous remote measurements of the composition of Jupiter by Voyager, IRIS, and earth-based spectroscopic observations.

------- GALILEO ORBITER, POLLACK--------------------------------

INVESTIGATION NAME- THERMAL AND DYNAMICAL PROPERTIES OF THE JOVIAN ATMOSPHERE (IDS)

NSSDC ID- JOPO -19

INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL
PI - J.B. POLLACK NASA-ARC

BRIEF DESCRIPTION
The purpose of this investigation is to determine the vertical temperature structure and dynamics of the Jovian atmosphere using data from all of the Probe investigations to characterize the roles of radiative heating, thermal convection, latent heat release, and internal energy sources.

------- GALILEO ORBITER, RUSSELL--------------------------------

INVESTIGATION NAME- INTERACTIONS OF JOVIAN AND SATELLITE MAGNETOSPHERES (IDS)

NSSDC ID- JOPO -20

INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
INTERPLANETARY PHYSICS

PERSONNEL
PI - C.T. RUSSELL U OF CALIF, LA

BRIEF DESCRIPTION
This investigation uses data from the Orbiter magnetometer, plasma, plasma wave, and energetic particle investigations (1) to study the Jovian magnetosphere and satellite-magnetosphere interactions (with emphasis on refining models of the Jovian main field); (2) to study the internal structure of the Galilean satellites from their interactions with the ambient medium; (3) to investigate the dynamics of the magnetosphere; and (4) to examine critically the observational data pertaining to energetic particle transport, acceleration, and loss in the Jovian magnetosphere.

------- GALILEO ORBITER, SAGAN--------------------------------

INVESTIGATION NAME- ORGANIC CHEMISTRY OF THE JOVIAN ATMOSPHERE (IDS)

NSSDC ID- JOPO -21

INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL
PI - C. SAGAN CORNELL U

BRIEF DESCRIPTION
This investigation uses data from the Orbiter near infrared mapping spectroscopy and ultraviolet spectroscopy investigations, together with the Probe composition and nephelometer investigations, to study the organic chemistry of the Jovian atmosphere, with emphasis on the nature of the organic and inorganic chromophores that produce the colors of the Jovian clouds.

------- GALILEO ORBITER, SCARF--------------------------------

INVESTIGATION NAME- WAVE-PARTICLE INTERACTION PHENOMENA AT JUPITER (IDS)

NSSDC ID- JOPO -22

INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - F.L. SCARF TRW SYSTEMS GROUP

BRIEF DESCRIPTION
This investigation uses magnetospheric data from the Orbiter plasma, plasma wave, and energetic particle investigations to study wave-particle integration phenomena, with emphasis on evaluating the effective transport coefficients (anomalous conductivity, pitch-angle diffusion coefficient, etc.) associated with the magnetospheric plasma instabilities and satellite-magnetosphere interactions.

------- GALILEO ORBITER, SCHUBERT--------------------------------

INVESTIGATION NAME- JOVIAN ATMOSPHERIC STRUCTURE AND CIRCULATION (IDS)

NSSDC ID- JOPO -23

INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL
PI - G. SCHUBERT U OF CALIF, LA

BRIEF DESCRIPTION
This investigation uses data from the Orbiter imaging investigation and from all of the Probe investigations to study the thermal and dynamical processes responsible for the global atmospheric circulation of Jupiter and the ways that these processes are influenced by the structure of the cloud layers.

------- GALILEO ORBITER, SONETT--------------------------------

INVESTIGATION NAME- GALILEAN SATELLITE MAGNETIC PROPERTIES + JOVIAN MAGNETOSPHERE INTERACTION (IDS)

NSSDC ID- JOPO -24

INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
INTERPLANETARY PHYSICS

PERSONNEL
PI - C.P. SONETT U OF ARIZONA

BRIEF DESCRIPTION
The purposes of this investigation are to use data from the Orbiter magnetometer, plasma, and plasma wave investigations to measure any intrinsic magnetic fields that may exist on the Galilean satellites and to investigate the processes whereby these satellites interact with the magnetosphere and main field of Jupiter, including comparisons to similar interactions involving the moon.

------- GALILEO ORBITER, VAN ALLEN--------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLES AND ROLE OF GALILEAN SATELLITES

NSSDC ID- JOPO -26

INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - J.A. VAN ALLEN U OF IOWA

BRIEF DESCRIPTION
The objectives of this experiment are to use data from the particles and fields experiments to study the physical dynamics (origin, accelerations, diffusion, and loss) of energetic charged particles in the Jovian magnetodisk with particular emphasis on the variability of phenomena with real time and with local time; the role of the Galilean satellites in the absorption, injection, acceleration, and diffusion of energetic charged particles; and acceleration, diffusion, and loss of energetic charged particles within the inner magnetosphere, and the overall energetics of the Jovian magnetosphere.

------- GALILEO ORBITER, WILLIAMS--------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTOR (EPD)

NSSDC ID- JOPO -06

INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - D.J.	WILLIAMS	APPLIED PHYSICS LAB
OI - T.P.	ARMSTRONG	U OF KANSAS
OI - T.A.	FRITZ	LOS ALAMOS NAT LAB
OI - S.M.	KRIMIGIS	APPLIED PHYSICS LAB
OI - L.J.	LANZEROTTI	BELL TELEPHONE LAB
OI - R.W.	MCENTIRE	APPLIED PHYSICS LAB
OI - J.G.	ROEDERER	U OF ALASKA
OI - E.C.	ROELOF	APPLIED PHYSICS LAB
OI - W.	STUDEMANN	MPI-AERONOMY
OI - B.	WILKEN	MPI-AERONOMY

BRIEF DESCRIPTION

The purposes of this investigation are (1) to study the detailed energy, angular distribution, and stability of trapped protons, electrons, and ions, and determine ion composition; (2) to investigate the interactions of these particles with the satellites and the solar wind; (3) to measure thermal plasma flow velocities and temperatures; and (4) to investigate adiabatic and nonthermal processes in the trapped radiation. The instrument package consists of a low-energy magnetospheric measurement system (LEMMS), a composition measurement system (CMS), and an instrument stepping platform. The LEMMS' energy range and charge response are 0.015 - 11 MeV for electrons and 0.02 - 55 MeV/nucleon for protons and ions. These are determined through magnetic deflection, dE/dx, and E techniques. The CMS uses dE/dx, E, time of flight, and pulse height analysis techniques to measure helium through iron with varying energy responses in the 0.15 - 100 MeV/nucleon range. The instrument package is mounted on the spinning section of the Orbiter. The total mass is 7.4 kg and the total power is 7.4 W.

**************************** GALILEO PROBE********************

SPACECRAFT COMMON NAME- GALILEO PROBE
ALTERNATE NAMES- JUPITER ORBITER PROBE, JOP
GALILEO

NSSDC ID- JOP

LAUNCH DATE- 05/30/86 WEIGHT- 250. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- JUPITER PROBE

PERSONNEL

MG - A.	DIAZ	NASA HEADQUARTERS
SC - W.	QUAIDE	NASA HEADQUARTERS
PM - J.	CASANI	NASA-JPL
PM - J.	SPERANS	NASA-ARC
PS - L.	COLIN	NASA-ARC
PS - T.V.	JOHNSON	NASA-JPL

BRIEF DESCRIPTION

The Probe is a staged-vented system composed of a deceleration module and a descent module. The Probe is launched from the Shuttle attached to the Galileo Orbiter with Centaur upper stages. Its mass and diameter are 250 kg and 1.2 m, respectively. The deceleration module consists of structure and heat shields. The descent module contains the science instruments. Probe electronics and power sources are vented to the Jovian atmosphere. A parachute is used to control the Probe descent rate. In situ science measurements are made prior to and during high-speed entry and descent. Power is supplied by a battery. Data are telemetered to the Orbiter, which in turn relays them to earth. The in situ measurements give information on the physical structure, chemical composition, and location of clouds in the troposphere, and the thermal balance of the planet. Data are stored in a memory unit for the period of communication blackout during entry, and then transmitted to the Orbiter, interleaved with real-time data.

------- GALILEO PROBE, BOESE------------------------------------

INVESTIGATION NAME- NET FLUX RADIOMETER (NFR)

NSSDC ID- JOP -04 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
PLANETARY ATMOSPHERES

PERSONNEL

PI - R.W.	BOESE	NASA-ARC
OI - J.B.	POLLACK	NASA-ARC
OI - P.M.	SILVAGGIO	LAWRENCE LIVERMORE LAB
OI - L.A.	SROMOVSKY	U OF WISCONSIN

BRIEF DESCRIPTION

The purposes of this investigation are (1) to measure vertical distribution of net flux of solar energy and planetary emission in the region of the atmosphere from 0.1 to 10 bars, (2) to determine the location of cloud layers, and (3) to obtain evidence on the mixing ratios of selected constituents and the opacity of clouds and aerosols in the infrared. A multichannel radiometer measures flux in about 30-deg cones alternately centered plus or minus 45 deg from the Probe horizontal. The radiometer has an onboard calibration system (two black bodies), a multidetector array (with channels at approximately 0.3 - 3.0, 0.3 - 2000, 20 - 30, 30 - 40, and 40 - 60 micrometers), and an array of six pyroelectric detectors. The radiometer is mounted on the Probe with external viewing after shield deployment. The total mass is 2.3 kg and the total power is 4.6 W.

------- GALILEO PROBE, LANZEROTTI------------------------------

INVESTIGATION NAME- LIGHTNING AND RADIO EMISSIONS (LRD)

NSSDC ID- JOP -06 INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
SPACE PLASMAS
PLANETARY MAGNETIC FIELD

PERSONNEL

PI - L.J.	LANZEROTTI	BELL TELEPHONE LAB
OI - G.	DEHMEL	BRAUNSCHWEIG TECH U
OI - F.O.	GLIEM	BRAUNSCHWEIG TECH U
OI - E.P.	KRIDER	U OF ARIZONA
OI - K.	RINNERT	MPI-AERONOMY
OI - M.	UMAN	U OF FLORIDA
OI - H.	FISCHER	U OF KIEL
OI - J.D.	MIHALOV	NASA-ARC
OI - G.	SCHMIDKE	U OF KIEL
OI - G.H.	WIBBERENZ	U OF KIEL

BRIEF DESCRIPTION

The objectives of this investigation are (1) to verify the existence of lightning on Jupiter and measure its basic physical characteristics and (2) to measure rf noise levels and one magnetic field component near Jupiter. Two instruments are used for this investigation: an electromagnetic sensor and an optical sensor. The electromagnetic sensor has a ferrite-core antenna with a preamplifier as an rf sensor. The frequency domain is 3, 15, and 100 kHz narrow-band. The time domain is 1 Hz to 100 kHz, and the resolution is 16 s. The optical sensor has a photodiode with a fisheye lens. There is coincidence and anticoincidence between the rf and optical sensors. The electromagnetic sensor is mounted under the Probe afterbody, while the optical sensor is mounted on the Probe envelope, looking out perpendicularly to the Probe spin axis. The total mass is 1.1 kg and the total continuous power is 1.0 W.

------- GALILEO PROBE, NIEMANN-------------------------------

INVESTIGATION NAME- NEUTRAL MASS SPECTROSCOPY (NMS)

NSSDC ID- JOP -03 INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL

PI - H.B.	NIEMANN	NASA-GSFC
OI - S.K.	ATREYA	U OF MICHIGAN
OI - G.R.	CARIGNAN	U OF MICHIGAN
OI - T.M.	DONAHUE	U OF MICHIGAN
OI - R.E.	HARTLE	NASA-GSFC
OI - D.M.	HUNTEN	U OF ARIZONA
OI - T.	OWEN	STATE U OF NEW YORK
OI - N.W.	SPENCER	NASA-GSFC

BRIEF DESCRIPTION

The objective of this investigation is to determine the chemical and isotopic composition and physical state of the Jovian atmosphere, including vertical variations from 0.1 to 10 bars or greater. Mixing ratios are determined for He to 1% accuracy and for H2O, CH4, and NH3 to 5% accuracy. The isotopic ratio of Ne20 to Ne22 is measured to an accuracy of 2%. All species with mass numbers 1 to 52, plus selected species at higher mass numbers (including krypton and xenon) are measured. The instrument is a quadrupole mass spectrometer with an electron impact ion source having redundant electron beam guns of variable kinetic energy and a secondary electron multiplier ion detector. The dual-channel sample inlet system includes an enrichment system for trace-gas and isotope determination, a tandem getter, and a sputter ion pump. The mass range is 1 - 52, 84, and 131 u. The dynamic range is 1.E+8. Other species with masses greater than 52 u can be sought at the sacrifice of integration time below 52 u. The scan period is 3 to 60 s. The instrument is mounted on the Probe with the sample inlet port near the stagnation point and the sample outlet port near the minimum pressure point. The total mass is 7.1 kg and the total power is 15 W.

------- GALILEO PROBE, RAGENT-------------------------------

INVESTIGATION NAME- NEPHELOMETRY (NEP)

NSSDC ID- JOP -05   INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
ATMOSPHERIC PHYSICS

PERSONNEL

PI - B.	RAGENT		NASA-ARC
OI - J.E.	BLAMONT		CNRS-SA
OI - G.W.	GRAMS		GEORGIA INST OF TECH
OI - J.B.	POLLACK		NASA-ARC

BRIEF DESCRIPTION
The objective of this investigation is to determine vertical extent, structure, and microphysical characteristics (particle size distribution, number density, and physical structure) of Jupiter's clouds over the range 0.1 to 10 bars. A single-wavelength, multiple-angle (5) scattering nephelometer, with a gallium-arsenide LED (9000 A) source and solid-state detectors is mounted on the Probe, with appropriate external viewing geometry. Deployment takes place after the heat shield is removed. The total mass is 1.8 kg and the total continuous power is 3.0 W.

------- GALILEO PROBE, SIEFF-------------------------------

INVESTIGATION NAME- ATMOSPHERIC STRUCTURE (ASI)

NSSDC ID- JOP -02   INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.	SIEFF	NASA-ARC
OI - R.C.	BLANCHARD	NASA-LARC
OI - D.B.	KIRK	NASA-ARC
OI - G.	SCHUBERT	U OF CALIF, LA
OI - S.C.	SOMMER(RETIRED)	NASA-ARC
OI - R.E.	YOUNG	NASA-ARC

BRIEF DESCRIPTION
The objective of this investigation is to determine temperature, pressure, density, and molecular weight over an altitude range from a threshold of about 1000 km above the cloud deck down to Probe failure (deeper than 10-bar pressure). The instrument package consists of acceleration, temperature, and pressure sensors and associated electronics. The package is mounted in the Probe with the accelerometers near the Probe's center of gravity. The temperature-sensing head and pressure inlet are deployed outside the Probe boundary layer. The total mass is 1.9 kg and the total continuous power is 5.5 W.

------- GALILEO PROBE, VON ZAHN-------------------------------

INVESTIGATION NAME- HELIUM ABUNDANCE (HAD)

NSSDC ID- JOP -01   INVESTIGATIVE PROGRAM
CODE EL/CO-OP

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL

PI - U.	VON ZAHN	U OF BONN
OI - H.-J.	HOFFMAN	MESSERSCHMIT-BOLK-BLOM
OI - D.M.	HUNTEN	U OF ARIZONA

BRIEF DESCRIPTION
The objective of this investigation is the precise (0.1%) determination of the helium abundance in the Jovian atmosphere from 3 to 8 bars. A two-arm, double-pathlength optical interferometer that includes an IR LED light source, an interference filter, and a photodetector array, is used to measure the refractive index difference between an atmospheric sample and a reference gas mixture. It is mounted on the Probe with an inlet pipe to the ambient atmosphere. The total mass is 1.0 kg and the total continuous power is 0.7 W.

*************************** GAMMA-1 ***************************

SPACECRAFT COMMON NAME- GAMMA-1
ALTERNATE NAMES- GAMMA-I

NSSDC ID- GAMMA-1

LAUNCH DATE- 00/00/86   WEIGHT- 7000. KG
LAUNCH SITE- UNKNOWN, U.S.S.R.
LAUNCH VEHICLE-

SPONSORING COUNTRY/AGENCY

U.S.S.R.	IKI
FRANCE	CESR
FRANCE	CNES

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 90. MIN   INCLINATION- 51. DEG
PERIAPSIS- 350. KM ALT   APOAPSIS- 350. KM ALT

PERSONNEL

BRIEF DESCRIPTION
The Gamma-1 spacecraft contains two instruments designed by a collaboration of two French and four Soviet laboratories. The objective of the mission is to observe high-energy gamma rays and X rays in space. Gamma-1 has a planned lifetime of 1 year.

------- GAMMA-1, GALPER-------------------------------

INVESTIGATION NAME- HIGH-ENERGY SPARK CHAMBER GAMMA-RAY TELESCOPE

NSSDC ID- GAMMA-1-01   INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - A.	GALPER	IKI
OI - V.	AKIMOV	IKI
OI - A.	BAZER-BACHI	CESR
OI - J.M.	LAVIGNE	CESR
OI - J.	LERAY	CENS
OI - P.	MANDROU	CESR
OI - V.	NESTEROV	IKI
OI - M.	NIEL	CESR
OI - B.	PARLIER	CENS
OI - G.	VEDRENNE	CESR
OI - M.	GROS	CENS

BRIEF DESCRIPTION
The Gamma-Ray Telescope is designed to observe high-energy gamma rays in the energy range 50 MeV to 5 GeV with an angular resolution of 5 arc-min. In the order encountered by a valid gamma-ray event, the telescope consists of (1) a coded aperture mask, (2) a 50-cm by 50-cm, 12-element, wide-gap spark chamber which is viewed with both a vidicon camera and a photographic camera, and surrounded by an anticoincidence detector, (3) a two-level time-of-flight telescope, (4) a single-element wide-gap spark chamber, and (5) a calorimeter which is a sandwich of lead plates and scintillation counters. The coded aperture mask is comprised of two 1-dimensional masks, each of which has a very small unit cell size (1 mm). This aperture mask allows angular resolution of 5 arc-min but limits the field of view to 2.5 deg FWHM. The 12-element spark chamber is designed to provide an energy resolution of 30% and a gamma-ray efficiency of 18% at 100 MeV. It is planned that cosmonauts will periodically retrieve the exposed film from the photographic camera and insert unexposed film. The time-of-flight telescope is the triggering mechanism for the Gamma-Ray Telescope and uses two levels of sectional plastic scintillation counters to detect relativistic charged particles moving toward the calorimeter. The single-element spark chamber above the calorimeter improves the calorimeter performance by giving the entry position of the electrons along with an indication of whether any energy has been removed from the calorimeter. The calorimeter measures gamma-ray energies to ~ 12% resolution at 100 MeV. The sensitivity of the Gamma-Ray Telescope allows it to detect sources with a flux of 1E(-6) photons/(sq cm-s) in 1 month of observation. The sensitivity and angular resolution are designed to provide improved definition of the characteristics of the galactic plane at gamma-ray wavelengths and position information on many of the localized excesses already observed. It is also possible for the telescope to detect new extragalactic sources within its small FOV.

------- GAMMA-1, GALPER-------------------------------

INVESTIGATION NAME- PULSAR X2, VARIABLE SOURCE X-RAY TELESCOPE

NSSDC ID- GAMMA-1-02   INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

PI - A.	GALPER	IKI
OI - V.	AKIMOV	IKI
OI - A.	BAZER-BACHI	CESR
OI - J.M.	LAVIGNE	CESR
OI - P.	MANDROU	CESR
OI - V.	NESTEROV	IKI
OI - M.	NIEL	CESR
OI - G.	VEDRENNE	CESR

ORIGINAL PAGE IS
OF POOR QUALITY

BRIEF DESCRIPTION

This instrument is designed to observe X-ray bursters, transients and pulsars in the energy range of 2 to 25 keV. It consists of four 150-sq-cm, thin-window proportional counters, each with a 10- by 10-deg FOV. The detectors are separated by 10 deg, giving an overall FOV of 30 by 30 deg and a resolution of 20 arc-min for sufficiently intense sources. The instrument contains electronics for on-board data analysis of amounts of data from milliseconds to days. These electronics are designed to analyze fluctuations and periodicities from microseconds to tenths of seconds.

**************************** GIOTTO****************************

SPACECRAFT COMMON NAME- GIOTTO
ALTERNATE NAMES-

NSSDC ID- GIOTTO

LAUNCH DATE- 07/15/85 WEIGHT- 950. KG
LAUNCH SITE- KOUROU (CENTRE SPATIAL GUYANAIS), FRENCH GUIANA
LAUNCH VEHICLE- ARIANE 3

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- COMET RENDEZVOUS

PERSONNEL

PM - D.	DALE	ESA-ESTEC
PS - R.	REINHARD	ESA-ESTEC

BRIEF DESCRIPTION

This mission is designed to encounter Halley's comet on March 13, 1986, at a distance of 0.89 AU from the sun and 0.98 AU from the earth at an angle of 107 deg from the comet-sun line. The spacecraft is based as much as possible on the ESA-GEOS spacecraft and is spin stabilized with a rate of 15 rpm. During the encounter with Halley's comet, the spin axis is aligned with the relative vector velocity. The 1.5-m dish antenna, operating at X-band, is inclined and despun in order to point at the earth (44 deg with respect to the velocity vector). The scientific payload of 10 experiments weighs 54.4 kg. A camera produces color photographs of the nucleus. Other objectives of the mission are (1) to determine the elemental and isotopic composition of volatile components in the cometary coma, particularly parent molecules; (2) to characterize the physical and chemical processes that occur in the cometary atmosphere and ionosphere; (3) to determine the elemental and isotopic composition of dust particles; (4) to measure total gas-production rate and dust flux and size/mass distribution; and to derive the dust-to-gas ratio; and (5) to investigate the macroscopic systems of plasma flows resulting from the cometary-solar wind interaction. The goal is to come within 500 km of Halley's comet at closest encounter. The spacecraft has a dust shield consisting of a front sheet of Al 1 mm thick and a 12-mm Kelvar near sheet separated by 25 cm, which should withstand impacts of particles up to 0.1 g. The experiments are switched on 3 h 45 min before closest approach. During the cruise mode, the spacecraft is controlled by ESOC using the 30-m antenna at Weilheim. For the 4-h encounter, the 64-m antenna at Parkes, Australia, is employed.

------- GIOTTO, BALSIGER--

INVESTIGATION NAME- ION MASS SPECTROMETER (IMS)

NSSDC ID- GIOTTO -03 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
PARTICLES AND FIELDS

PERSONNEL

PI - H.	BALSIGER	U OF BERNE
OI - E.G.	SHELLEY	LOCKHEED PALO ALTO
OI - R.G.	JOHNSON	OF. OF SCI&TECH POLICY
OI - H.S.	BRIDGE	MASS INST OF TECH
OI - A.J.	LAZARUS	MASS INST OF TECH
OI - B.E.	GOLDSTEIN	NASA-JPL
OI - W.T.	HUNTRESS	NASA-JPL
OI - M.M.	NEUGEBAUER	NASA-JPL
OI - R.M.	GOLDSTEIN	NASA-JPL
OI - E.	UNGSTRUP	DANISH SPACE RES INST
OI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - R.	SCHWENN	MPI-AERONOMY
OI - W.-H.	IP	MPI-AERONOMY
OI - D.T.	YOUNG	LOS ALAMOS NAT LAB
OI - R.D.	SHARP	LOCKHEED PALO ALTO
OI - J.	GEISS	U OF BERNE
OI - F.	BUEHLER	U OF BERNE
OI - R.	BENSON	TEXAS A+M

BRIEF DESCRIPTION

The objective of the investigation is to measure the ion composition, energy, and angular distribution in the coma of Comet Halley. The instrument consists of two sensors: the High-Energy Range Spectrometer (HERS) specialized for the outer coma and the High-Intensity Spectrometer (HIS) specialized for the inner coma. The HERS sensor has (1) an electrostatic mirror for deflecting ions from the spacecraft ram direction into the sensor, instead of having the solar wind ions enter; (2) cylindrical acceleration grids which change the energy of the ions so they can pass through the magnetic analyzer; (3) a sector magnet that acts as a momentum/charge filter; (4) an electrostatic deflection plate that sorts the ions by energy/charge; and (5) particle detectors consisting of a two-dimensional microchannel plate (MCP) and channel-electron-multipliers (CEM) for measuring mass/charge and elevation angle. The energy range is from 20 eV to nearly 16 keV, depending on the M/Q, and the mass is determined in 3 or 4 mass groups (e.g., 1 to 4, 4 to 16, 16 to 64 u) with a mass resolution of M/delta M equal to about 20. The elevation angle, the polar angle relative to the spin axis, covers 30 deg and is measured in 4 bins, giving a resolution of 7.5 deg. The azimuth angle is spin-scanned and has a resolution of 4 deg. The MCP allows the simultaneous measurement of mass and elevation angle for a given ion momentum per charge (8 kV). A complete scan over mass, energy, and angle takes about 12 s, but other scans can be selected. The HIS sensor is used to measure the relatively cold, low-energy cometary species. This sensor has (1) a set of deflection plates above the spacecraft skin; (2) a quadrispherical lens followed by (3) a set of acceleration grids; (4) a permanent magnet; (5) a second quadrispherical lens, or analyzer; (6) a block of glass with conductive surfaces with holes in four directions that serves as a particle distributor and amplifier; and (7) 16 CEMs to detect the emergent particles. HIS measures energies from 300 to 1625 eV over a M/Q of 12 - 65 with a resolution (M/Delta M) of about 20, in an elevation angular range of 27 deg. The azimuth angle is spin-scanned and the time resolution for a set of measurements is about 4 s. The density range covered by HERS is 1.E-3 to 1.E2/cc, while that for HIS is 1.E-2 to 1.E4/cc. The instrument uses a microprocessor for operation and control. More details about this instrument can be found in "The Giotto Mass Spectrometer" by Balsiger et al., ESA SP-169, June 1981.

------- GIOTTO, JOHNSTONE--

INVESTIGATION NAME- COMETARY PLASMA ION MASS AND ENERGY PER CHARGE ANALYZERS

NSSDC ID- GIOTTO -05 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
PARTICLES AND FIELDS

PERSONNEL

PI - A.D.	JOHNSTONE	MULLARD SPACE SCI LAB
OI - W.C.	FELDMAN	LOS ALAMOS NAT LAB
OI - P.	CERULLI	CNR, SPACE PLASMA LAB
OI - A.	EGIDI	CNR, SPACE PLASMA LAB
OI - M.	DOBROWOLNY	CNR, SPACE PLASMA LAB
OI - H.	REME	CESR
OI - M.K.	WALLIS	U COLLEGE CARDIFF
OI - J.D.	WINNINGHAM	SOUTHWEST RES INST
OI - K.	JOCKERS	MPI-AERONOMY
OI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - B.	WILKEN	MPI-AERONOMY
OI - W.	STUDEMANN	MPI-AERONOMY
OI - D.A.	BRYANT	RUTHERFORD APPLETON L.
OI - D.R.	LEPINE	RUTHERFORD APPLETON L.
OI - R.	LUEST	ESA
OI - H.U.	SCHMIDT	MPI-PHYS ASTROPHYS
OI - G.	PASCHMANN	MPI-EXTRATERR PHYS
OI - L.F.B.	BIERMANN	MPI-EXTRATERR PHYS
OI - G.	HAERENDEL	MPI-EXTRATERR PHYS
OI - V.	FORMISANO	CNR, SPACE PLASMA LAB
OI - R.	TERENZI	CNR, SPACE PLASMA LAB

BRIEF DESCRIPTION

The objective of this investigation is to measure the plasma flow around Comet Halley in order to study (1) the mass loading of the solar wind by ions of cometary origin, (2) the existence, location, and strength of the upstream shock transition in the solar wind flow, (3) the position of and forces controlling the pressure balance surface between the cometary and the solar plasma, (4) the processes that form tail rays and other discrete visible features in the coma, and (5) the detection of wave motion induced by the cometary interaction that leads to the thermalization of solar wind and implanted ions. The instrument employs two sensors. One is a 270-deg spherical electrostatic energy analyzer (EEA) with a microchannel plate detector that measures the three-dimensional energy/charge distribution of positive ions from 10 eV to 20 keV over the polar angle range 20 - 180 deg with respect to the spin axis of the spacecraft. A complete set of measurements is obtained every spin period (4 s). The second sensor consists of a quadrispherical EEA with six time-of-flight analyzers set at different polar angles in the range 20 - 160 deg. The three-dimensional energy distribution of five major mass groups of ions up to 44 u over the energy range 0.1 - 70 keV is measured in 32 spin periods (128 s).

------- GIOTTO, KELLER--

INVESTIGATION NAME- HALLEY NUCLEUS IMAGING (HMC)

NSSDC ID- GIOTTO -01

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
INTERPLANETARY PHYSICS

PERSONNEL

PI - H.U.	KELLER	MPI-AERONOMY
OI - R.M.	BONNET	ESA
OI - C.B.	COSMOVICI	DFVLR
OI - W.A.	DELAMERE	BALL AEROSPACE SYS DIV
OI - C.	JAMAR	INST D'ASTROPHYSIQUE
OI - C.	BARBIERI	INST DI ASTRONOMIA
OI - C.	ARPIGNY	INST D'ASTROPHYSIQUE
OI - L.F.B.	BIERMANN	MPI-EXTRATERR PHYS
OI - G.	COLOMBO	U OF PADOVA
OI - W.F.	HUEBNER	LOS ALAMOS SCI LAB
OI - D.W.	HUGHES	U OF SHEFFIELD
OI - F.L.	WHIPPLE	HARVARD COLLEGE OBS
OI - W.K.H.	SCHMIDT	MPI-AERONOMY
OI - K.	WILHELM	MPI-AERONOMY
OI - D.	MALAISE	INST D'ASTROPHYSIQUE
OI - S.	CAZES	CNRS-LPSP
OI - P.	BENVENUTI	INST DI ASTRONOMIA
OI - P.	SEIGE	DFVLR

BRIEF DESCRIPTION

The Halley Multicolor Camera (HMC) is designed to provide high-resolution images of the nucleus and the coma of Halley's comet in nine colors and two polarizations. The camera operates in a spin-scan mode and uses a 1-m focal length Ritchey-Chretien telescope with an effective f number of 7.68. The instanteous field of view is 1.5 deg with no vignetting and the whole sphere can be viewed using rotation of the camera, tilting of the 45-deg deflecting mirror, and the spacecraft spin. The entrance collimator is at 90 deg with respect to the telescope axis of symmetry, which is the axis of rotation for the whole system. The light is deflected by 90 deg by a mirror that can be adjusted by about 1 deg about an axis perpendicular to the plane of symmetry of the telescope. The sensors are two area charge-coupled devices (CCD) and one Reticon. The CCDs have two segments each that provide 390 x 292 pixels while the Reticon has 2 x 936 pixels. The pixel size in micrometers is 22.3 x 22.3 for the CCDs and 30 x 375 for the Reticon. The spectral response of the whole system is about 350 to 1100 nm and a filter wheel is used to obtain 4 bands simultaneously for color and polarization or 11 broad and narrow bands alternately. The resolution in observing the comet is 11 m/pixel at a slant range of 500 km.

------- GIOTTO, KISSEL---

INVESTIGATION NAME- DUST IMPACT MASS SPECTROMETER (PIA)

NSSDC ID- GIOTTO -04

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
DUST

PERSONNEL

PI - J.	KISSEL	MPI-NUCLEAR PHYS
OI - Z.	SEKANINA	NASA-JPL
OI - N.G.	UTTERBACK	NASA-JPL
OI - B.C.	CLARK	MARTIN-MARIETTA AEROSP
OI - H.A.	ZOOK	NASA-JSC
OI - H.	FECHTIG	MPI-NUCLEAR PHYS
OI - E.	GRUN	MPI-NUCLEAR PHYS
OI - H.J.	VOELK	MPI-NUCLEAR PHYS
OI - E.K.	JESSBERGER	MPI-NUCLEAR PHYS
OI - F.R.	KRUEGER	MPI-NUCLEAR PHYS
OI - J.A.M.	MCDONNELL	U OF KENT, CANTERBURY
OI - G.H.	SCHWEHM	RUHR-U BOCHUM
OI - G.E.	MORFILL	MPI-PHYS/ASTROPHYS
OI - J.	RAHE	BAMBERG OBSERVATORY
OI - E.B.	IGENBERGS	TECH U OF MUNICH
OI - K.	KORNUNG	U AT MUNICH-NEUBIBERG

BRIEF DESCRIPTION

The objective of this investigation is to determine the chemical and physical properties of the dust particles released by Comet Halley. The instrument is a redesign of the one flown on Helios-A and -B by Fechtig and colleagues. The chemical composition and the mass of individual particles are measured. The impact count as a function of the position relative to the comet's nucleus provides the mass distribution and the rate of production of dust. The measurements should provide (1) the elemental abundance of individual particles, (2) compositional distribution around the comet, and (3) determination of specific isotopic ratios, such as 6Li/7Li, 10B/11B, or 12C/13C. The instrument consists of (1) an adjustable entrance port, (2) a target of atomic mass >105, (3) a set of acceleration grids, (4) a two-section time-of-flight drift tube, (5) an ion reflector chamber, and an electron multiplier tube. The particles are measured by the charge of the impact plasma, the impact light flash, and mass dispersion through the time-of-flight tube. Calibration with a ground-based dust accelerator is imperative to the interpretation of the data. The instrument handles an impact rate up to 100/s, which is controlled by the variable entrance port (1 - 500 sq mm) under microprocessor control and covers the particle mass range from 3.E-16 to 5.E-10 g. The mass resolution M/delta M is 200 at 100 u and the dynamic range that can be handled in one mass spectrum is 1.E3. Additional detail for this instrument can be found in "The Particulate Impact Analyzer, an Instrument to Analyze Small Particles Released by Halley's Comet" by J. Kissel, ESA SP-169, June 1981.

------- GIOTTO, KRANKOWSKY---

INVESTIGATION NAME- NEUTRAL MASS SPECTROMETER (NMS)

NSSDC ID- GIOTTO -02

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL

PI - D.	KRANKOWSKY	MPI-NUCLEAR PHYS
OI - P.	LAMMERZAHL	MPI-NUCLEAR PHYS
OI - P.X.	EBERHARDT	U OF BERNE
OI - U.	HERRMANN	U OF BERNE
OI - J.J.	BERTHELIER	CRPE, CNRS-CNET
OI - J.M	ILLIANO	CNRS-CRPE
OI - J.H.	HOFFMAN	U OF TEXAS, DALLAS
OI - R.R.	HODGES	U OF TEXAS, DALLAS
OI - H.U.	KELLER	MPI-AERONOMY
OI - M.	FESTOU	CNRS-SA

BRIEF DESCRIPTION

The objective of the investigation is to identify the chemical nature of the neutral gas molecules and ionic species in the coma of Comet Halley, and to measure their chemical and isotopic abundances and their velocity distributions. The instrument consists of two sensors: (1) the M-analyzer that will provide direct mass analysis in the range 1-36 u, and (2) the E-analyzer that will provide energy analysis in the range from about 25 eV to 2.1 keV, corresponding to kinetic energies of coma particles with masses between 1 u and 86 u, at the relative probe velocity of 68.7 km/s. The energy analyzer is a parallel plate electrostatic deflector using an extended focal plane detector to cover the entire range in two or three measurements. The mass analyzer is a parallel plate deflector followed by a magnet; this configuration provides double focusing; i.e., suprathermal species having different energies resulting from their motions in the comet frame of reference will still be focused. The detectors are microchannel plates followed by an array of charge-sensitive anodes. Both analyzers cycle between a neutral mode when gas molecules are ionized by electrons bombarding them in a fly-through type source, and an ion mode measuring ambient cometary ions. At greater distance from the nucleus (until 1 h before closest encounter) the experiment provides ion composition and directional analysis, by applying variable deflecting voltages in front of the analyzers. During the close encounter, emphasis is on the neutral gas investigation which includes low ionization energies for the discrimination of fragmentation effects. Repetition periods are in the order of 3 s which gives a spatial resolution of about 200 km.

------- GIOTTO, LEVASSEUR-REGOURD-------------------------------

INVESTIGATION NAME- HALLEY OPTICAL PROBE (HOPE)

NSSDC ID- GIOTTO -09

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS

PERSONNEL

PI - A.C.	LEVASSEUR-REGOURD	CNRS-SA
OI - J.L.	WEINBERG	U OF FLORIDA
OI - P.	LAMY	CNRS-LAS

BRIEF DESCRIPTION

The optical probe technique is employed in this investigation to determine, unequivocally, changes in the densities of emissive gases (OH, C2, CN, CO+, and CS) and scattering dust, as well as to measure the optical properties of dust, in the coma of Halley's comet. The instrument contains no moving parts and performs photopolarimetric measurements parallel to the direction of motion through the coma. The choice of wavelengths is the following: 368, 444, 575, and 718 nm for dust, and 307, 387, 462, and 514 nm for gases. The rapid motion of the spacecraft allows line-of-sight measurements to be differenced so that the resulting brightnesses and polarizations refer to the small volume of space of about 140 km length centered at the moving probe.

------- GIOTTO, MCDONNELL---

INVESTIGATION NAME- DUST IMPACT DETECTOR (DID)

NSSDC ID- GIOTTO -08

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
DUST

ORIGINAL PAGE IS
OF POOR QUALITY

PERSONNEL

PI - J.A.M.MCDONNELL		U OF KENT, CANTERBURY
OI - W.M.	ALEXANDER	BAYLOR U
OI - D.W.	HUGHES	U OF SHEFFIELD
OI - E.B.	IGENBERGS	TECH U OF MUNICH
OI - R.J.L.GRARD		ESA-ESTEC
OI - D.H.	CLARK	RUTHERFORD APPLETON L.
OI - G.H.	SCHWEHM	RUHR-U BOCHUM
OI - Z.	SEKANINA	NASA-JPL
OI - M.S.	HANNER	NASA-JPL
OI - B.A.	LINDBLAD	LUND OBS
OI - E.	GRUN	MPI-NUCLEAR PHYS
OI - A.	MINAFRA	U OF BARI
OI - J.C.	MANDEVILLE	CERT/ONERA
OI - E.	BUSSOLETTI	U OF LECCE

BRIEF DESCRIPTION

The investigation uses a system comprised of an array of dust impact sensors to answer some of the fundamental questions in cometary science, namely, the measure of the particulate mass efflux from a comet, its mass distribution, and the particulate grain density. Using the entire surface of the meteoroid shield of the spacecraft system, the array of sensors is able to detect masses over the range 1.E-17 to 1.E-3 g, and perhaps even larger. The upper limit is dependent on the maximum mass of the particulate matter intercepted by the probe during the fly-by. This mass range encompasses almost all the non-volatile comet nucleus component, currently believed to comprise 50% of the comet mass. The range also encompasses about 90% of the mass and scattering area distributions of the zodiacal cloud. The instrumentation is comprised of (1) an impact plasma micro-perforation and sensing array which determines the mass, penetration properties, density and ionization of the impacting particles in the range 1.E-17 to 1.E-10 g; (2) a penetration-initiated capacitor discharge array for determining the impacting flux above a precisely defined threshold of 1.E-9 g; and (3) a meteoroid shield array incorporating three transducers on the front shield and one on the rear shield. The latter array determines the impact position and momentum exchange of the entire probe from the mass range 1.E-10 to 1.E-3 g, or larger. The techniques have been selected with a special regard for Halley's comet environment and the anticipated high flux rates based on experience from previous missions. The comparison of different detection techniques and correlation of independent sensor outputs has guided the design. Reliability of event detection in the unexplored environment of the comet is high and the limiting accuracy of the measurements is believed to be better than 20% over a dynamic range of 1.E+14. A microprocessor is used to monitor each sensor status and to process each event as well as the cumulative data, which represents the total event amplitude distribution from each sensor.

------- GIOTTO, MCKENNA-LAWLOR ---------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLES ONSET ADMONITOR (EPONA)

NSSDC ID- GIOTTO -10

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - S.M.P.MCKENNA-LAWLOR		ST PATRICK'S COLLEGE
OI - E.	KIRSCH	MPI-AERONOMY
OI - A.	THOMPSON	DUBLIN INST ADV STUDY
OI - D.	O'SULLIVAN	DUBLIN INST ADV STUDY
OI - D.B.	MELROSE	U OF SYDNEY
OI - K.P.	WENZEL	ESA-ESTEC

BRIEF DESCRIPTION

The purpose of this investigation is to study, at high spatial and temporal resolution, the energetic charged particles in the environment of Comet Halley (e.g., those produced by acceleration at Comet Halley's bow shock and/or in its tail). Observations of energetic particles and their angular distributions, taken in conjunction with onboard magnetic measurements, can determine whether the magnetic field lines in the cometary tail are open or closed. Encounter data can be used to provide the background corrections for those devices on other Giotto experiments which are sensitive to energetic particle radiation. The instrument employs both active and passive shielding of surface barrier detectors along with dE/dx vs E circuitry to measure: electrons above about 15 keV, protons above about 20 keV, and particles with Z greater than or equal to 2 above 2.1 MeV with eight separate energy channels. Two identical particle telescopes are used at each of the two viewing angles except that one at each angle has an additional foil over its aperture for the purpose of separating low-energy protons from low-energy electrons. The telescopes are pointed at 45 and 137 deg with respect to the spacecraft spin axis and provide some measure of the angular distribution. The instrument can operate in two modes, namely (a) in a real-time mode and (b) in a cruise or storage mode. During the real-time mode a 0.5-s time resolution is available in the 8 energy channels in each of 16 angular sectors. In the storage mode 48-min-averaged solar particle flux measurements with quadrisectored information from selected energy channels yield data concerning solar particle propagation in the corona and in interplanetary space.

------- GIOTTO, NEUBAUER ---------------------------------------

INVESTIGATION NAME- MAGNETOMETER (MAG)

NSSDC ID- GIOTTO -07

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PLANETARY MAGNETIC FIELD
PARTICLES AND FIELDS

PERSONNEL

PI - F.M.	NEUBAUER	U OF COLOGNE
OI - N.F.	NESS	NASA-GSFC
OI - L.F.	BURLAGA	NASA-GSFC
OI - M.H.	ACUNA	NASA-GSFC
OI - F.	MARIANI	U OF ROME
OI - H.U.	SCHMIDT	MPI-PHYS ASTROPHYS
OI - E.	UNGSTRUP	DANISH SPACE RES INST
OI - M.K.	WALLIS	U COLLEGE CARDIFF
OI - G.	MUSMANN	BRAUNSCHWEIG TECH U

BRIEF DESCRIPTION

The purpose of this investigation is to study the interplanetary and induced cometary magnetic fields before and during the encounter with Comet Halley. The instrument consists of a main triaxial fluxgate magnetometer system mounted on top of a tripod on the spacecraft. In a 12-bit analog-to-digital conversion the dynamical ranges are plus and minus 16, 64, 256, 1024, 4096, 16384, and 65536 nT with automatic range switching. An inner biaxial magnetometer system is used for correcting the spacecraft magnetic field. During the encounter the sampling rate will be approximately 28 vectors per second, while the spacecraft spin rate is 15 rpm.

------- GIOTTO, REME ---

INVESTIGATION NAME- ELECTRON ESA AND POSITIVE ION CLUSTER COMPOSITION ANALYZER (RPA)

NSSDC ID- GIOTTO -06

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
PARTICLES AND FIELDS

PERSONNEL

PI - H.	REME	CESR
OI - C.	D'USTON	CESR
OI - F.	COTIN	CESR
OI - J.A.	SAUVAUD	CESR
OI - D.A.	MENDIS	U OF CALIF, SAN DIEGO
OI - R.P.	LIN	U OF CALIF, BERKELEY
OI - A.	WEKHOF	U OF CALIF, BERKELEY
OI - K.A.	ANDERSON	U OF CALIF, BERKELEY
OI - C.W.	CARLSON	U OF CALIF, BERKELEY
OI - A.	KORTH	MPI-AERONOMY
OI - A.K.	RICHTER	MPI-AERONOMY
OI - A.D.	JOHNSTONE	MULLARD SPACE SCI LAB

BRIEF DESCRIPTION

The purpose of the investigation is to measure and study the three-dimensional distributions of electrons and ions, as well as the ion composition, in the vicinity of Halley's comet. These studies will help to determine: (1) the nature of the comet tail and the solar wind interaction with the comet; (2) the chemical and physical nature of the cometary atmosphere and ionosphere; and (3) the chemical and physical structure of the cometary nucleus. The instrument consists of two major units, a symmetric quadrispherical electrostatic analyzer (ESSA) for electrons and a positive ion composition analyzer (PICCA). ESSA covers the energy range 10 eV - 30 keV with a resolution of 0.1 and has a field of view (FOV) of 360 x 4 deg. It is constructed of two concentric hemispheres with a circular opening, a circular top cap which determines the entrance aperture, and 16 channel-electron-multipliers (CEM) for detectors. The energy range is swept every 0.25 s and the spin period is about 4 s. PICCA consists of an electrostatic deflection plate above the spacecraft skin, a hemispherical ESA, electrostatic optics, and a fast-counting CEM. The mass range measured is 10 - 233 u with a delta M of <1. The FOV is 3 deg x 3 deg and the device has a dynamic range in density from 1.E-3 to 1.E4/cc. More details can be found in "The Copernicus Experiment to Measure Three-Dimensional Electron Distribution and the Composition of Thermal Positive Ions Including Water Clusters near Comet Halley" by Reme et al., in ESA SP-169, June 1981.

************************** GOES-G **************************

SPACECRAFT COMMON NAME- GOES-G
ALTERNATE NAMES-

NSSDC ID- GOES-G

LAUNCH DATE- 05/00/86 WEIGHT- 660. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES — NOAA-NESS
UNITED STATES — NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 1440. MIN — INCLINATION- 0.1 DEG
PERIAPSIS- 35788. KM ALT — APOAPSIS- 35788. KM ALT

PERSONNEL
MG - J.R. GREAVES — NASA HEADQUARTERS
PM - G.W. LONGANECKER — NASA-GSFC
PS - W.E. SHENK — NASA-GSFC

BRIEF DESCRIPTION
GOES-G is the ninth in a series of NASA-developed, NOAA-operated, geosychronous and operational spacecraft. The spin-stabilized spacecraft carries: (1) a visible infrared spin-scan radiometer (VISSR) atmospheric sounder (VAS) to provide high-quality day/night cloudcover data, to take radiance derived temperatures of the earth/atmosphere system, and to determine atmospheric temperature and water vapor content at various levels; (2) a meteorological data collection system to relay processed data from central weather facilities to regional stations equipped with APT and to collect and retransmit data from remotely located earth-based platforms; and (3) a space environment monitor (SEM) system to measure proton, electron, and solar X-ray fluxes and magnetic fields. The cylindrically shaped spacecraft measures 190.5 cm in diameter and 230 cm in length, exclusive of a magnetometer that extends an additional 83 cm beyond the cylindrical shell. The primary structural members are a honeycombed equipment shelf and a thrust tube. The VISSR telescope is mounted on the equipment shelf and views the earth through a special aperture in the side of the spacecraft. A support structure extends radially from the thrust tube and is affixed to the solar panels, which form the outer wall of the spacecraft to provide the primary source of electrical power. Located in the annulus-shaped space between the thrust tube and the solar panels are stationkeeping and dynamics control equipment, batteries, and most of the SEM equipment. Proper spacecraft attitude and spin rate (approximately 100 rpm) are maintained by two separate sets of jet thrusters mounted around the spacecraft equator and activated by ground command. The spacecraft uses both UHF-band and S-band frequencies in its telemetry and command subsystem. A low-power VHF transponder provides telemetry and command during launch and then serves as a backup for the primary subsystem once the spacecraft attains synchronous orbit.

------- GOES-G, LEINBACH---

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- GOES-G -02 — INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - H. LEINBACH — NOAA-ERL
PI - H.H. SAUER — NOAA-ERL

BRIEF DESCRIPTION
The energetic particle monitor consists of three detector assemblies, each covering limited regions of the overall energy spectrum. The first two detector assemblies monitor protons in seven energy ranges between 0.8 and 500 MeV, and alpha particles in six ranges from 4 to >400 MeV. There is also one channel for the measurement of electrons in the >=500 keV range. The third detector, the high energy proton and alpha detector (HEPAD), monitors protons in four energy ranges above 370 MeV and alpha particles in two energy ranges above 640 MeV/nucleon.

------- GOES-G, LEINBACH---

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- GOES-G -03 — INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH — NOAA-ERL
PI - H.H. SAUER — NOAA-ERL

BRIEF DESCRIPTION
The X-ray monitor consists of ion chamber detectors. The ranges and minimum useful threshold sensitivities are 0.5 to 3 A, 1.0E-13 J per sq cm per s and 1 to 8 A, 1.0E-12 J per sq cm per s with a dynamic range of 1.0E4.

------- GOES-G, LEINBACH---

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- GOES-G -04 — INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - H. LEINBACH — NOAA-ERL
PI - H.H. SAUER — NOAA-ERL

BRIEF DESCRIPTION
The magnetometer has a range of plus or minus 400 nT (without saturation) and a resolution of 0.1 nT over a range of plus or minus 50 nT.

------- GOES-G, NESDIS STAFF---------------------------------------

INVESTIGATION NAME- VISIBLE INFRARED SPIN-SCAN RADIOMETER
ATMOSPHERIC SOUNDER (VAS)

NSSDC ID- GOES-G -01 — INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF — NOAA-NESDIS
OI - W.E. SHENK — NASA-GSFC

BRIEF DESCRIPTION
The Visible Infrared Spin-Scan Radiometer (VISSR) Atmospheric Sounder (VAS) operates in three distinct modes to provide parameter measurement flexibility, spectral band selection, geographic location, and variable sensitivity. The VISSR mode is the same as the VISSR system on board GOES 1, 2, 3. Both the IR channel (10.5 to 12.5 micrometers) and visible channel (0.55 to 0.75 micrometers) use common optics. Incoming radiation is collected by a Ritchey-Chretien optical system. One west-to-east raster line is formed for each revolution of the spacecraft. A 20-deg north-to-south (N-to-S) frame results from a total of 1821 steps of the scan mirror, one 0.192-mrad step for each spacecraft revolution. A full picture takes 18.2 min to complete and 2 min to reset for the next image. Eight visible-spectrum detectors (0.9 km horizontal resolution) and one mercury-cadmium-telluride IR detector (6.9 km horizontal resolution) sweep the earth during each scan. The dwell-sounding mode uses up to 12 spectral filters in a wheel covering the range 678.7 per cm (14.74 micrometers) through 2535 per cm (3.94 micrometers) positioned into the optical train while the scanner is dwelling on a single N-to-S scan line. The filter wheel is programmed so that each spectral band filter dwells on a single scan line for from 0 to 255 spacecraft spins. Either the 6.9-km- or 13.8-km-resolution detectors can be selected for the seven filter positions operating in the spectral region 701.6 per cm (14.25 micrometers) through 1487 per cm (6.725 micrometers). For the remaining five spectral bands, the 13.8-km-resolution detectors are used. Selectable frame size, position and scan direction are also programmable via ground command. For the VAS demonstration, 10-bit reduced resolution (3.5 km) visible data are provided for imaging. In some of the spectral regions, multiple-line data are required to enhance the signal-to-noise ratio. Typically, 20-50 satellite spins at the same N-to-S scan line position are required to obtain the desired sounding data. This number of spins per line can provide the soundings a 30- : 30-km resolution. The multispectral imaging (MSI) mode can provide normal VISSR IR imaging plus data in any two selected spectral bands having a spatial resolution of 13.8 km. This mode of operation takes advantage of the small mercury-cadmium-telluride detector offset in the N-to-S plane. Using the data from these detectors simultaneously produces a complete infrared map when they are operated every other scan line. This allows using the larger detectors during half of the imaging/scanning sequence period to obtain additional spectral information. Unlimited N-to-S frame size and position selection, within the maximum N-to-S FOV scan direction, can be selected. Visible data are not available in this mode. The VISSR output is digitized and transmitted to the NOAA Command and Data Acquisition Station, Wallops Island, Va. There the signal is fed into a "line stretcher," where it is stored and time-stretched. The processed data are immediately transmitted back to the satellite at reduced bandwidth for rebroadcast to APT user stations and regional forecast centers. The VISSR data are handled by NOAA and eventually sent to the Satellite Data Services Division, National Climatic Center, Washington, D.C., for archiving. Data from the VAS MSI mode and the dwell sounding mode are not "stretched".

------- GOES-G, NESDIS STAFF---------------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM

NSSDC ID- GOES-G -05 — INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

ORIGINAL PAGE IS
OF POOR QUALITY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION

The meteorological data collection system is an experimental communications and data handling system designed to receive and process meteorological data collected from remotely located earth-based data collection (observation) platforms (DCP). The collected data are retransmitted from the satellite to ground-based, regional data utilization centers. Data from up to 10,000 DCP stations can be handled by the system. The system also allows for the retransmission of narrow-band (WEFAX-type) data from centralized weather facilities to ground-based APT receiving stations. This communications system operates on S-band frequencies. The minimum data collection system for one small meteorological satellite consists of approximately 3500 DCP stations to be contacted in a 6-h period. The total amount of data collected during the 6-h period is between 350 and 600 kilobits, depending on the coding techniques. Data received from individual stations vary from 50 to 3000 bits, depending on the type and variety of sensors used at an individual DCP station.

*************************** GOES-H ***************************

SPACECRAFT COMMON NAME- GOES-H
ALTERNATE NAMES-

NSSDC ID- GOES-H

LAUNCH DATE- 08/00/86 WEIGHT- 660. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 1440. MIN INCLINATION- 0.1 DEG
PERIAPSIS- 35788. KM ALT APOAPSIS- 35788. KM ALT

PERSONNEL
MG - J.R. GREAVES NASA HEADQUARTERS
PM - G.W. LONGANECKER NASA-GSFC
PS - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION

GOES-H is the tenth in a series of NASA-developed, NOAA-operated, geosynchronous and operational spacecraft. The spin-stabilized spacecraft carries (1) a visible infrared spin-scan radiometer (VISSR) atmospheric sounder (VAS) to provide high-quality day/night cloudcover data, to take radiance derived temperatures of the earth/atmosphere system, and to determine atmospheric temperature and water vapor content at various levels, (2) a meteorological data collection system to relay processed data from central weather facilities to regional stations equipped with APT and to collect and retransmit data from remotely located earth-based platforms, and (3) a space environment monitor (SEM) system to measure proton, electron, and solar X-ray fluxes and magnetic fields. The cylindrically shaped spacecraft measures 190.5 cm in diameter and 230 cm in length, exclusive of a magnetometer that extends an additional 83 cm beyond the cylindrical shell. The primary structural members are a honeycombed equipment shelf and a thrust tube. The VISSR telescope is mounted on the equipment shelf and views the earth through a special aperture in the side of the spacecraft. A support structure extends radially from the thrust tube and is affixed to the solar panels, which form the outer wall of the spacecraft to provide the primary source of electrical power. Located in the annulus-shaped space between the thrust tube and the solar panels are stationkeeping and dynamics control equipment, batteries, and most of the SEM equipment. Proper spacecraft attitude and spin rate (approximately 100 rpm) are maintained by two separate sets of jet thrusters mounted around the spacecraft equator and activated by ground command. The spacecraft uses both UHF-band and S-band frequencies in its telemetry and command subsystem. A low-power VHF transponder provides telemetry and command during launch and then serves as a backup for the primary subsystem once the spacecraft attains synchronous orbit.

------- GOES-H, LEINBACH ---

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- GOES-H -02 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION

The energetic particle monitor consists of three detector assemblies, each covering limited regions of the overall energy spectrum. The first two detector assemblies monitor protons in seven energy ranges between 0.8 and 500 MeV, and alpha particles in six ranges from 4 to >400 MeV. There is also one channel for the measurement of electrons in the >=500 keV range. The third detector, the high energy proton and alpha detector (HEPAD), monitors protons in four energy ranges above 370 MeV and alpha particles in two energy ranges above 640 MeV/nucleon.

------- GOES-H, LEINBACH ---

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- GOES-H -03 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION

The X-ray monitor consists of ion chamber detectors. The ranges and minimum useful threshold sensitivities are 0.5 to 3 A, 1.0E-13 J per sq cm per s and 1 to 8 A, 1.0E-12 J per sq cm per s with a dynamic range of 1.0E4.

------- GOES-H, LEINBACH ---

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- GOES-H -04 INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION

The magnetometer has a range of plus or minus 400 nT (without saturation) and a resolution of 0.1 nT over a range of plus or minus 50 nT.

------- GOES-H, NESDIS STAFF --

INVESTIGATION NAME- VISIBLE INFRARED SPIN-SCAN RADIOMETER ATMOSPHERIC SOUNDER (VAS)

NSSDC ID- GOES-H -01 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS
OI - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION

The Visible Infrared Spin-Scan Radiometer (VISSR) Atmospheric Sounder (VAS) operates in three distinct modes to provide parameter measurement flexibility, spectral band selection, geographic location, and variable sensitivity. The VISSR mode is the same as the VISSR system on board GOES 1, 2, 3. Both the IR channel (10.5 to 12.5 micrometers) and visible channel (0.55 to 0.75 micrometers) use common optics. Incoming radiation is collected by a Ritchey-Chretien optical system. One west-to-east raster line is formed for each revolution of the spacecraft. A 20-deg north-to-south (N-to-S) frame results from a total of 1821 steps of the scan mirror, one 0.192-mrad step for each spacecraft revolution. A full picture takes 18.2 min to complete and 2 min to reset for the next image. Eight visible-spectrum detectors (0.9 km horizontal resolution) and one mercury-cadmium-telluride IR detector (6.9 km horizontal resolution) sweep the earth during each scan. The dwell-sounding mode uses up to 12 spectral filters in a wheel covering the range 678.7 per cm (14.74 micrometers) through 2535 per cm (3.94 micrometers) positioned into the optical train while the scanner is dwelling on a single N-to-S scan line. The filter wheel is programmed so that each spectral band filter dwells on a single scan line for from 0 to 255 spacecraft spins. Either the 6.9-km- or 13.8-km-resolution detectors can be selected for the seven filter positions operating in the spectral region 701.6 per cm (14.25 micrometers) through 1487 per cm (6.725 micrometers). For the remaining five spectral bands, the 13.8-km-resolution detectors are used. Selectable frame size, position and scan direction are also programmable via ground command. For the VAS demonstration, 10-bit reduced resolution (3.5 km) visible data are provided for imaging. In some of the spectral regions, multiple-line data are required to enhance the signal-to-noise ratio. Typically, 20-50 satellite spins at the same N-to-S scan line position are required to obtain the desired sounding data. This number of spins per line can provide the soundings a 30- x 30-km resolution. The multispectral imaging (MSI) mode can provide normal VISSR IR imaging plus data in any two

selected spectral bands having a spatial resolution of 13.8 km. This mode of operation takes advantage of the small mercury-cadmium-telluride detector offset in the N-to-S plane. Using the data from these detectors simultaneously produces a complete infrared map when they are operated every other scan line. This allows using the larger detectors during half of the imaging/scanning sequence period to obtain additional spectral information. Unlimited N-to-S frame size and position selection, within the maximum N-to-S FOV scan direction, can be selected. Visible data are not available in this mode. The VISSR output is digitized and transmitted to the NOAA Command and Data Acquisition Station, Wallops Island, Va. There the signal is fed into a "line stretcher," where it is stored and time-stretched. Processed data are immediately transmitted back to the satellite at reduced bandwidth for rebroadcast to APT user stations and regional forecast centers. The VISSR data are handled by NOAA and eventually sent to the Satellite Data Services Division, National Climatic Center, Washington, D.C., for archiving. Data from the VAS MSI mode and the dwell sounding mode are not "stretched".

------- GOES-H, NESDIS STAFF-------------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM

NSSDC ID- GOES-H -05 INVESTIGATIVE PROGRAM CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S) METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION
The meteorological data collection system is an experimental communications and data handling system designed to receive and process meteorological data collected from remotely located earth-based data collection (observation) platforms (DCP). The collected data are retransmitted from the satellite to ground-based, regional data utilization centers. Data from up to 10,000 DCP stations can be handled by the system. The system also allows for the retransmission of narrow-band (WEFAX-type) data from centralized weather facilities to ground-based APT receiving stations. This communications system operates on S-band frequencies. The minimum data collection system for one small meteorological satellite consists of approximately 3500 DCP stations to be contacted in a 6-h period. The total amount of data collected during the 6-h period is between 350 and 600 kilobits, depending on the coding techniques. Data received from individual stations vary from 50 to 3000 bits, depending on the type and variety of sensors used at an individual DCP station.

*************************** GRM-A1 ***************************

SPACECRAFT COMMON NAME- GRM-A1
ALTERNATE NAMES- GEOPOTENTIAL RES MISS-A1

NSSDC ID- GRM-A1

LAUNCH DATE- 01/00/89 WEIGHT- 2800. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 88. MIN INCLINATION- 90. DEG
PERIAPSIS- 160. KM ALT APOAPSIS- 160. KM ALT

PERSONNEL
MS - E.A. FLINN, III NASA HEADQUARTERS
MG - T.L. FISCHETTI NASA HEADQUARTERS
PS - D.E. SMITH NASA-GSFC
PS - R.A. LANGEL NASA-GSFC

BRIEF DESCRIPTION
The Geopotential Research Mission (GRM) consists of a pair of spacecraft in identical polar orbits at 160 km altitude, but with a nominal 300-km separation from each other. The objective of the GRM is to determine the earth's gravity and magnetic fields in order to provide accurate mathematical models for studies of the structure, composition and movement of the solid earth and oceans; resource exploration; orbit determination; and navigation. The spacecraft are flown in a "drag-free" orbit obtained by providing thrust to counter the atmospheric drag forces. A disturbance compensation system senses the drag forces and actuates the thrusters. Accurate measurement of the gravity field is obtained by the sensitive spacecraft-to-spacecraft velocity measurement system. The precise orbital position is measured using the ground-based Doppler tracking stations operated by the Defense Mapping Agency (DMA). The two spacecraft are alike with respect to the gravity field detection system, but this particular spacecraft, A1, also carries scalar and vector magnetometers, with four star cameras to provide accurate orientation information for the vector magnetometer. Command, telemetry, and tracking use the TDRSS Single Access (SA) link. In order to operate with the TDRSS, the conformal array antennas are in two parts to allow communications whether approaching or receding from a particular TDRS. Redundant data storage devices are used to record the data during the TDRSS Zone of Exclusion (ZOE), during switchover from one TDRS to the other, and at other times as required. Recorder playback at a rate of 34 kbps for 12 min is required for one orbit of data. The disturbance compensation system contains a 14-cm diameter ball housed in a 16-cm diameter spherical cavity in which the position of the ball is electrically sensed. When in orbit, the ball responds only to the gravity fields as the spacecraft shields the ball from all other forces. When the position of the ball in the cavity changes, the sensor commands the propulsion system to "fly" the spacecraft to re-center the ball in the cavity. The propulsion system is able to move the spacecraft linearly and angularly with six degrees of freedom, so that the ball remains at the center of the cavity. Since the ball is attracted by the mass of the spacecraft and the propulsion fuel, the fuel must be balanced between the front and rear tanks to null out the gravity fields generated by the mass of fuel in each tank. NASA standard reaction wheels are used to provide the torque to control the spacecraft. An onboard computer provides for autonomous control of the spacecraft, independent of ground command control. To eliminate perturbations that could be induced by rotating solar panels, the panels are rigidly attached. The solar array can support an orbital average load of 400 W. The structure of the spacecraft consists of an axial cruciform aluminum basic frame which supports all of the subsystems. Strong rings at each end support the 1-m diameter propellant tanks. The outer monocoque shell is a secondary structural element and serves primarily to support the thermal heat pipes and the solar array mounted on the upper half of the cylindrical surface. A 4-m boom separates the magnetometers from the main body of the spacecraft. Because of the need for stability of the thermal rate of change of spacecraft dimensions, the thermal design concept uses the lower half of the spacecraft as a radiator for internal power and isolates the upper body and solar array from the lower body and from each other. Heat pipes are used to distribute heat uniformly over the spacecraft. Expected mission lifetime is 7 months, with 6 months of scientific data.

------- GRM-A1, ACUNA-------------------------------------

INVESTIGATION NAME- VECTOR MAGNETOMETER

NSSDC ID- GRM-A1 -03 INVESTIGATIVE PROGRAM CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S) GEODYNAMICS PARTICLES AND FIELDS

PERSONNEL
PI - M.H. ACUNA NASA-GSFC

BRIEF DESCRIPTION
The vector magnetometer is a triaxial fluxgate instrument similar to that flown on Magsat (79-094A-02). This magnetometer has a dynamic range of positive and negative 2000 nT and, with the use of offset generators, provides a total operational range of 64,000 nT. The accuracy is 3 nT, with a resolution of 0.5 nT. Both the scalar and vector magnetometers are mounted on the same 4-m boom extending from the end of the spacecraft.

------- GRM-A1, FARTHING-------------------------------------

INVESTIGATION NAME- SCALAR MAGNETOMETER

NSSDC ID- GRM-A1 -02 INVESTIGATIVE PROGRAM CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S) GEODYNAMICS PARTICLES AND FIELDS

PERSONNEL
PI - W.H. FARTHING NASA-GSFC

BRIEF DESCRIPTION
The scalar magnetometer is a cesium vapor instrument similar to that flown on Magsat (79-094A-01). This magnetometer determines the absolute value of the magnetic field to an accuracy of 1 nT. Both the scalar and vector magnetometers are mounted on the same 4-m boom extending from the end of the spacecraft.

------- GRM-A1, SMITH-------------------------------------

INVESTIGATION NAME- SST (S/C-TO-S/C TRACKING)

NSSDC ID- GRM-A1 -01 INVESTIGATIVE PROGRAM CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S) GEODYNAMICS

PERSONNEL
PI - D.E. SMITH NASA-GSFC

BRIEF DESCRIPTION

The objective of the spacecraft-to-spacecraft tracking (SST) instrument is to measure the relative velocity between the two spacecraft. The Doppler frequency shift due to changes in the relative velocity between the two spacecraft (which are orbiting at 160 km altitude and separated by about 300 km) is done at two frequencies: 91 and 42 GHz. A continuous wave signal is radiated by the GRM-A1 spacecraft to the GRM-A2 spacecraft, which receives it and compares it to an onboard signal. At the same time the A2 spacecraft is radiating an incrementally frequency-shifted signal to the A1 spacecraft where it is compared. The resulting continuous comparison of the signals serves to measure the velocity changes to a value of 1.E-6 m/s. The gravity field is determined by processing the Doppler data that will be time-correlated to the spacecraft position as measured by the ground-based tracking network. This network, operated by the Defense Mapping Agency, provides a spacecraft-to-ground Doppler shift measurement. The two sets (spacecraft-to-spacecraft and spacecraft-to-ground) of Doppler data are processed at GSFC to provide a geoid relating the gravitational field strength to a geographic location on the earth. Accuracy of 2.5 milligal is obtained with 100-km spatial resolution.

**************************** GRM-A2 ******************************

SPACECRAFT COMMON NAME- GRM-A2
ALTERNATE NAMES- GEOPOTENTIAL RES MISS-A2

NSSDC ID- GRM-A2

LAUNCH DATE- 01/00/89 WEIGHT- 2600. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 88. MIN INCLINATION- 90. DEG
PERIAPSIS- 160. KM ALT APOAPSIS- 160. KM ALT

PERSONNEL
MS - E.A. FLINN, III NASA HEADQUARTERS
MG - T.L. FISCHETTI NASA HEADQUARTERS
PS - D.E. SMITH NASA-GSFC
PS - R.A. LANGEL NASA-GSFC

BRIEF DESCRIPTION

The Geopotential Research Mission (GRM) consists of a pair of spacecraft in identical polar orbits at 160 km altitude, but with a nominal 300-km separation from each other. The objective of the GRM is to determine the earth's gravity and magnetic fields in order to provide accurate mathematical models for studies of the structure, composition and movement of the solid earth and oceans; resource exploration; orbit determination; and navigation. The spacecraft are flown in a "drag-free" orbit obtained by providing thrust to counter the atmospheric drag forces. A disturbance compensation system senses the drag forces and actuates the thrusters. Accurate measurement of the gravity field is obtained by the sensitive spacecraft-to-spacecraft velocity measurement system. The precise orbital position is measured using the ground-based Doppler tracking stations operated by the Defense Mapping Agency (DMA). The two spacecraft are alike with respect to the gravity field detection system, but this particular spacecraft, A2, carries no magnetometers. Command, telemetry, and tracking use the TDRSS Single Access (SA) link. In order to operate with the TDRSS, the conformal array antennas are in two parts to allow communications whether approaching or receding from a particular TDRS. Redundant data storage devices are used to record the data during the TDRSS Zone of Exclusion (ZOE), during switchover from one TDRS to the other, and at other times as required. Recorder playback at a rate of 34 kbps for 12 min is required for one orbit of data. The disturbance compensation system contains a 14-cm diameter ball housed in a 16-cm diameter spherical cavity in which the position of the ball is electrically sensed. When in orbit, the ball responds only to the gravity fields as the spacecraft shields the ball from all other forces. When the position of the ball in the cavity changes, the sensor commands the propulsion system to "fly" the spacecraft to re-center the ball in the cavity. The propulsion system is able to move the spacecraft linearly and angularly with six degrees of freedom, so that the ball remains at the center of the cavity. Since the ball is attracted by the mass of the spacecraft and the propulsion fuel, the fuel must be balanced between the front and rear tanks to null out the gravity fields generated by the mass of fuel in each tank. NASA standard reaction wheels are used to provide the torque to control the spacecraft. An onboard computer provides for autonomous control of the spacecraft, independent of ground command control. To eliminate perturbations that could be induced by rotating solar panels, the panels are rigidly attached. The solar array can support an orbital average load of 400 W. The structure of the spacecraft consists of an axial cruciform aluminum basic frame which supports all of the subsystems. Strong rings at each end support the 1-m diameter propellant tanks. The outer monocoque shell is a secondary structural element and serves primarily to support the thermal heat pipes and the solar array mounted on the upper half of the cylindrical surface. Because of the need for stability of the thermal rate of change of spacecraft dimensions, the thermal design concept uses the lower half of the spacecraft as a radiator for internal power and isolates the upper body and solar array from the lower body and from each other. Heat pipes are used to distribute heat uniformly over the spacecraft. Expected mission lifetime is 7 months, with 6 months of scientific data.

------- GRM-A2, SMITH--

INVESTIGATION NAME- SST (S/C-TO-S/C TRACKING)

NSSDC ID- GRM-A2 -01 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
GEODYNAMICS

PERSONNEL
PI - D.E. SMITH NASA-GSFC

BRIEF DESCRIPTION

The objective of the spacecraft-to-spacecraft tracking (SST) instrument is to measure the relative velocity between the two spacecraft. The Doppler frequency shift due to changes in the relative velocity between the two spacecraft (which are orbiting at 160 km altitude and separated by about 300 km) is done at two frequencies: 91 and 42 GHz. A continuous wave signal is radiated by the GRM-A1 spacecraft to the GRM-A2 spacecraft, which receives it and compares it to an onboard signal. At the same time the A2 spacecraft is radiating an incrementally frequency-shifted signal to the A1 spacecraft where it is compared. The resulting continuous comparison of the signals serves to measure the velocity changes to a value of 1.E-6 m/s. The gravity field is determined by processing the Doppler data that will be time-correlated to the spacecraft position as measured by the ground-based tracking network. This network, operated by the Defense Mapping Agency, provides a spacecraft-to-ground Doppler shift measurement. The two sets (spacecraft-to-spacecraft and spacecraft-to-ground) of Doppler data are processed at GSFC to provide a geoid relating the gravitational field strength to a geographic location on the earth. Accuracy of 2.5 milligal is obtained with 100-km spatial resolution.

**************************** GRO ********************************

SPACECRAFT COMMON NAME- GRO
ALTERNATE NAMES- GAMMA-RAY OBSERVATORY

NSSDC ID- GRO

LAUNCH DATE- 05/00/88 WEIGHT- 14000. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 92.5 MIN INCLINATION- 28.5 DEG
PERIAPSIS- 400. KM ALT APOAPSIS- 400. KM ALT

PERSONNEL
MG - B.R. MCCULLAR NASA HEADQUARTERS
SC - A.G. OPP NASA HEADQUARTERS
PM - J.J. MADDEN NASA-GSFC
PS - D.A. KNIFFEN NASA-GSFC

BRIEF DESCRIPTION

The Gamma-Ray Observatory (GRO) is designed as a free-flying satellite launched from the Space Shuttle, carrying five gamma-ray instruments that require sustained pointing toward gamma-ray sources in space. The spacecraft is stabilized in three axes. GRO is supported by a mechanical structure which, in addition to the scientific instruments, houses an attitude-control system, a power system, and a command and communications system. All the main subsystems are redundant for increased reliability of the mission. The planned operating life in orbit is 2 years. Data are retrieved through the TDRSS. The objective of the mission is to conduct exploration of the gamma-ray spectrum originating in our galaxy and beyond. Observations span the energy range from 30 keV to 30 GeV with better than 10 times the sensitivity of previous missions. Low-energy studies attempt to determine the origin of gamma-ray bursts. Medium- and high-energy studies address numerous astrophysical questions.

------- GRO, FICHTEL--

INVESTIGATION NAME- HIGH-ENERGY GAMMA-RAY TELESCOPE

NSSDC ID- GRO -04 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY
ASTRONOMY
HIGH ENERGY ASTROPHYSICS

PERSONNEL
PI - C.E. FICHTEL NASA-GSFC
PI - R. HOFSTADTER STANFORD U
PI - K. PINKAU MPI-EXTRATERR PHYS
OI - D.L. BERTSCH NASA-GSFC
OI - A.J. FAVALE GRUMMAN AEROSPACE CORP
OI - R.C. HARTMAN NASA-GSFC
OI - E.B. HUGHES STANFORD U
OI - D.A. KNIFFEN NASA-GSFC
OI - H.A. MAYER-HASSELWANDER MPI-EXTRATERR PHYS
OI - H. ROTHERMEL MPI-EXTRATERR PHYS
OI - E.J. SCHNEID GRUMMAN AEROSPACE CORP
OI - M.K. SOMMER MPI-EXTRATERR PHYS
OI - D.J. THOMPSON NASA-GSFC

BRIEF DESCRIPTION
The instrument is a pictorial-type telescope using a digitized spark chamber to identify the electron pair produced by a gamma-ray interaction, and a large NaI(TL) scintillator crystal to determine the gamma-ray energy. The specific objectives of the experiment are (1) to search for localized sources (e.g., neutron stars, black holes) in the 20 MeV to 30 GeV range and study their properties, (2) to improve location accuracy of known sources, (3) to search for evidence of cosmic-ray particle acceleration in supernova remnants, (4) to study gamma-ray bursts and line emission from solar flares, (5) to obtain a detailed picture of the diffuse gamma-ray emission from our galaxy, and study galactic dynamics, cosmic-ray composition, and magnetic fields, (6) to study other galaxies, both normal and peculiar, and (7) to study the diffuse celestial radiation as it relates to cosmology. The instrument weighs 1830 kg, uses 180 W and has a data rate of 6859 bps.

------- GRO, FISHMAN---

INVESTIGATION NAME- TRANSIENT-EVENT MONITOR

NSSDC ID- GRO -05 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY
ASTRONOMY
HIGH ENERGY ASTROPHYSICS

PERSONNEL
PI - G.J. FISHMAN NASA-MSFC
OI - C.A. MEEGAN NASA-MSFC
OI - T.A. PARNELL NASA-MSFC

BRIEF DESCRIPTION
The six-detector array of the transient-event monitor provides definitive data on (1) the distribution of gamma-ray burst sizes (log n - log s curve) down to 6E-15 J/sq cm, (2) the precise direction of many sources through interplanetary timing, (3) the general location of numerous additional burst sources, and (4) fluctuations and spectral changes on time scales of 1 ms or less. These data not only impose constraints upon theories of burst sources and their emission mechanism, but may provide identifications with optical or X-ray objects. The experiment also provides GRO with a monitor of the entire unocculted sky for transient events and bursts. The experiment package consists of 12 48-cm diameter, 1.27-cm thick NaI(TL) disks with anti-coincidence shields. The energy range is 60 to 600 keV in approximately six channels; the time resolution is 0.1 microsecond. The package weighs 790 kg, uses 157 W, and has a data rate of 3555 bps.

------- GRO, KURFESS---

INVESTIGATION NAME- SCINTILLATION SPECTROMETER

NSSDC ID- GRO -02 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY
ASTRONOMY
HIGH ENERGY ASTROPHYSICS

PERSONNEL
PI - J.D. KURFESS US NAVAL RESEARCH LAB
OI - M. ULMER NORTHWESTERN U
OI - W.N. JOHNSON US NAVAL RESEARCH LAB
OI - R.L. KINZER US NAVAL RESEARCH LAB
OI - G.H. SHARE US NAVAL RESEARCH LAB
OI - C. DYER ROYAL AIRCRAFT ESTABL
OI - D.D. CLAYTON RICE U

BRIEF DESCRIPTION
The instrument is composed of four identical high-sensitivity scintillation detectors that are independently mounted on one-axis orientation systems. For most observations, two detectors are pointed at the source while the other two are offset by 15 deg for simultaneous background measurements. For time-variable phenomena, all four detectors can be pointed at the source for maximum sensitivity. Of particular interest are observations of nuclear line radiation from supernovae, novae, neutron stars, accretion onto black holes, solar flares, and continuum radiation. The detectors are optimized in the 0.1 to 10 MeV range but have additional capability for measurements from 10 to 150 MeV. The FOV is 9 deg with an effective area of 1507 sq cm at 0.51 MeV. The time resolution is 8 s in normal mode and 4 microseconds in burst mode. All detectors can be solar pointed for flare observations without affecting the other instruments on the spacecraft. The instrument weighs 1900 kg, uses 161 W, and has a data rate of 6492 bps.

------- GRO, SCHONFELDER---

INVESTIGATION NAME- IMAGING COMPTON TELESCOPE

NSSDC ID- GRO -03 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY
ASTRONOMY
HIGH ENERGY ASTROPHYSICS

PERSONNEL
PI - V. SCHONFELDER MPI-EXTRATERR PHYS
OI - B.N. SWANENBURG U OF LEIDEN
OI - J.A. LOCKWOOD U OF NEW HAMPSHIRE
OI - B.G. TAYLOR ESA-ESTEC
OI - J.A.M.BLEEKER U OF LEIDEN
OI - A.J.M.DEERENBERG U OF LEIDEN
OI - W. HERMSEN U OF LEIDEN
OI - W.R. WEBBER U OF NEW HAMPSHIRE
OI - K. BENNETT ESA-ESTEC
OI - R.D. WILLS ESA-ESTEC
OI - G. LICHTI MPI-EXTRATERR PHYS

BRIEF DESCRIPTION
The investigation employs an imaging Compton telescope that covers the 1 to 30 MeV energy range. This instrument is able to overcome background problems and provide unprecedented sensitivity and spatial resolution. The scientific objectives of this experiment are (1) study of intensities, spectra, and spatial distribution of localized sources to an intensity of about 1/50 of the Crab Nebula, (2) study of the diffuse galactic emission in the energy range where electromagnetic processes are expected to dominate, (3) study of the diffuse cosmic intensity, and (4) study of broadened line emission from excited nuclei in the diffuse galactic emission and from localized sources, including the sun, using the 1-sq-m NaI detectors with an energy resolution of about 10% FWHM and an angular resolution of 2 to 6 deg (FWHM). The instrument weighs 1460 kg, uses 216 W, and has a data rate of 6125 bps.

*************************** HIPPARCOS ***************************

SPACECRAFT COMMON NAME- HIPPARCOS
ALTERNATE NAMES- SPACE ASTROMETRY

NSSDC ID- HIPPA

LAUNCH DATE- 04/00/88 WEIGHT- 1025. KG
LAUNCH SITE- KOUROU (CENTRE SPATIAL GUYANAIS), FRENCH GUIANA
LAUNCH VEHICLE- ARIANE

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 1436. MIN INCLINATION- 3. DEG
PERIAPSIS- 35266. KM ALT APOAPSIS- 36304. KM ALT

PERSONNEL
PM - L. EMILIANI ESA-ESTEC
PS - M.A.C.PERRYMAN ESA-ESTEC

BRIEF DESCRIPTION
The scientific goals of this mission are the accurate measurement of the trigonometric parallaxes, proper motions, and positions of 1.E5 selected stars, mostly fainter than 10th magnitude. The spacecraft consists of two platforms and six vertical panels, all made of Al honeycomb. The solar array consists of three deployable sections. Antennas are located on the top and bottom of the spacecraft. An attitude and orbit-control subsystem ensures correct dynamic attitude control and determination during the 2.5-year planned lifetime. The spacecraft spins around its Z-axis at the rate of 12 rev/day at an angle of 43 deg to the sun. The Z-axis rotates about the sun-satellite line at 6.4 rev/year. The spacecraft carries a single telescope which, in the focal plane, superimposes two fields of view 58 deg apart. The attitude of the spacecraft about its CG is controlled to scan the celestial sphere in a regular movement. The telescope uses a system of grids, at the focal surface, composed of alternate opaque and transparent bands. Behind these grids, an image-dissector tube converts the modulated light into a sequence of photon counts from which the phase of the entire pulse train from a star can be derived. The apparent angle between two stars in the combined fields of view is obtained from the phase difference of the two star pulse trains. The telescope is an all-reflective eccentric Schmidt system. A complex mirror is employed which consists of two mirrors tilted in opposite directions, each occupying half of the rectangular entrance pupil. The unvignetted field of view is 94 arc-min by 54 arc-min. An additional photomultiplier system, known as Tycho, views a beam splitter in the optical path and is used to gather photometric and astrometric data of 4.E5 stars down to 11th magnitude. Measurements are made in two broad bands corresponding to B and V in the Johnson BUV system. The

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positions of these latter stars will be determined to a precision of 0.05 arc-s, which is a factor of 25 less than the main mission stars. The mission is a facility type in which guest investigators propose particular research programs, and selected stars are incorporated into the overall observing strategy.

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SPACECRAFT COMMON NAME- HST
ALTERNATE NAMES- LARGE SPACE TELESCOPE, SPACE TELESCOPE
HUBBLE SPACE TELESCOPE, ST

NSSDC ID- LST

LAUNCH DATE- 06/00/86 WEIGHT- 11000. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY

UNITED STATES	NASA-OSSA
INTERNATIONAL	ESA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 94.5 MIN INCLINATION- 28.8 DEG
PERIAPSIS- 500. KM ALT APOAPSIS- 500. KM ALT

PERSONNEL

MG - M.	BENSIMON	NASA HEADQUARTERS
SC - E.J.	WEILER	NASA HEADQUARTERS
PM - J.B.	ODOM	NASA-MSFC
PM - F.A.	CARR	NASA-GSFC
PS - R.	BROWN	NASA-MSFC
PS - A.	BOGGESS	NASA-GSFC

BRIEF DESCRIPTION
The Hubble Space Telescope (HST) is a spaceborne, diffraction-limited Ritchey-Chretien telescope with the following characteristics: an effective aperture of 2.4 m, a spatial resolution of 0.1 arc-s, and a wavelength coverage from 0.1 to 1000 micrometers. The expected limiting visual magnitude is between 27 and 28. HST has 10 times better resolution with greater wavelength coverage than that of ground-based telescopes; detectable objects can be 50 times fainter than those observable with the largest earth-based telescopes. The telescope is capable of accommodating five different instruments at its focal plane. The Space Shuttle is to be used for the initial launch, and in-orbit servicing. The anticipated minimum operational lifetime, excluding downtime for periodic maintenance and updating, is greater than 15 yr. The HST system serves as an international astronomical space observatory facility. The use of the onboard instrumentation is open to scientists of all countries. Its design is flexible to allow for the replacement of scientific instrumentation when necessary, to incorporate technological advances, and to satisfy changes in the observational interests of the astronomical community. Instrumentation updating, repair, or replacement can be accomplished by using suited astronauts for in-orbit work.

------- HST, BLESS--

INVESTIGATION NAME- HIGH-SPEED PHOTOMETER

NSSDC ID- LST -06 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - R.C.	BLESS	U OF WISCONSIN
OI - G.W.	VAN CITTERS	U OF TEXAS, AUSTIN
OI - E.L.	ROBINSON	U OF TEXAS, AUSTIN
OI - J.L.	ELLIOT	CORNELL U
OI - J.	DOLAN	NASA-GSFC

BRIEF DESCRIPTION
The high-speed photometer (HSP) investigation makes fast-time-resolution (down to 10 microseconds) photometric observations of rapidly varying objects in the spectral range 1150 to 8700 A and linear polarimetric observations from 2100 to 7000 A of a wide variety of objects. It establishes an accurate link between observations made on existing visual and UV photometric systems and the corresponding observations of the objects observed by the HST Faint Object Camera. The instrument consists of four image dissectors: two sensitive in the UV and solar blind, the others sensitive in the visible and near infrared. A wide variety of bandpasses is formed by broadband and interference filters arranged in strips near the HST focus. Some of the filters are coated with a polarizing material. Apertures provide a choice of three fields of view: 0.4, 1.0, and 10.8 arc-s. The dissectors can be commanded to receive photoelectrons from any of the approximately 100 filter-aperture-polarizer combinations available.

------- HST, BRANDT--

INVESTIGATION NAME- HIGH-RESOLUTION SPECTROGRAPH (HRS)

NSSDC ID- LST -02 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - J.C.	BRANDT	NASA-GSFC
OI - D.S.	LECKRONE	NASA-GSFC
OI - A.	BOGGESS, 3RD	NASA-GSFC
OI - E.A.	BEAVER	U OF CALIF, SAN DIEGO
OI - S.R.	HEAP	NASA-GSFC
OI - J.B.	HUTCHINGS	DOMINION ASTROPHYS OBS
OI - M.A.	JURA	U OF CALIF, LA
OI - J.L.	LINSKY	U OF COLORADO
OI - S.P.	MARAN	NASA-GSFC
OI - B.D.	SAVAGE	U OF WISCONSIN
OI - A.M.	SMITH	NASA-GSFC
OI - L.M.	TRAFTON	U OF TEXAS, AUSTIN
OI - R.J.	WEYMANN	U OF ARIZONA
OI - D.	EBBETS	SPACE TELESCOPE SCI IN

BRIEF DESCRIPTION
This investigation uses an ultraviolet spectrograph capable of obtaining high-quality spectra at two resolving powers: 20,000 and 120,000. The lower dispersion is achieved with four gratings that cover the spectral range 1100 to 3200 A so that each grating is used only near its maximum blaze efficiency. The higher dispersion utilizes an echelle arrangement. The sensor is a multi-channel pulse-counting device, the digicon. This detector operates functionally like an image-dissector tube and can be used as an image dissector to perform star centering and field mapping of the entrance aperture, eliminating the need for a separate star tracker or slit camera. There are two detectors, one with a CsTe photocathode and one with CsI. The two target entrance apertures have fields of view of 1 sq arc-s and 0.3 sq arc-s, respectively. There are no significant time constraints. The high-resolution spectrograph (HRS) operates in sunlight so that it can be utilized at all times, except when the source is occulted by the earth or moon. The high dynamic range and choice of dispersions make it possible to observe a large range of stellar magnitudes, from very bright to moderately faint. The HRS bridges the gap between objects observed by rocket-borne spectrographs (Copernicus, IUE) and the faint-object spectrograph (FOS).

------- HST, HARMS--

INVESTIGATION NAME- FAINT-OBJECT SPECTROGRAPH (FOS)

NSSDC ID- LST -03 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - R.J.	HARMS	U OF CALIF, SAN DIEGO
OI - F.	BARTKO, JR.	MARTIN-MARIETTA AEROSP
OI - E.A.	BEAVER	U OF CALIF, SAN DIEGO
OI - H.C.	FORD	SPACE TELESCOPE SCI IN
OI - B.	MARGON	U OF WASHINGTON
OI - A.F.	DAVIDSEN	JOHNS HOPKINS U
OI - E.M.	BURBIDGE	U OF CALIF, SAN DIEGO
OI - J.R.	ANGEL	U OF ARIZONA
OI - P.C.	BOHLIN	SPACE TELESCOPE SCI IN

BRIEF DESCRIPTION
The faint-object spectrograph (FOS) investigation obtains spectra of astronomical objects at the faintest possible limiting magnitude in ultraviolet and visible wavelengths. The spectrograph covers a broad spectral range and is intended for spectroscopy primarily at modest spectral resolution. The spectral profiles of broad emission and absorption features and continuum flux distributions are observed in both extended and point sources. The FOS is a fixed-slit spectrograph with the capability of selecting either of two spectral resolving powers (150 or 1200) over the wavelength range 1140 to 7000 A. A nondispersive mode is also available, providing camera images for scientific and target acquisition purposes. A polarization-analyzer capability is provided over the wavelength range 1200 to 3500 A. The FOS uses digicon detectors (512-diode linear arrays of photon-counting diodes). To cover the full wavelength range, two detectors are used. The far-ultraviolet/blue sensor has a magnesium fluoride faceplate and a bi-alkali photocathode. The near-UV/near-IR sensor has a fused silica window and an extended-red tri-alkali photocathode.

------- HST, JEFFERYS--

INVESTIGATION NAME- ASTROMETRY SCIENCE

NSSDC ID- LST -09 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - W.H.	JEFFERYS	U OF TEXAS, AUSTIN
OI - G.F.	BENEDICT	U OF TEXAS, AUSTIN
OI - P.D.	HEMENWAY	U OF TEXAS, AUSTIN
OI - P.J.	SHELUS	U OF TEXAS, AUSTIN
OI - R.L.	DUNCOMBE	U OF TEXAS, AUSTIN
OI - W.F.	VAN ALTENA	YALE U
OI - O.G.	FRANZ	LOWELL OBSERVATORY
OI - L.W.	FREDRICK	U OF VIRGINIA

BRIEF DESCRIPTION
This investigation uses the facilities of the optical telescope assembly, instead of requiring a separate instrument. The HST guidance system consists of three identical fine guidance sensors (FGS) distributed in an annulus centered on the optical axis of the HST. Each sensor has its own field of view (FOV). In normal operations, two of the sensors are used for fine pointing the HST. The sensor that is not used for telescope pointing is the primary astrometric instrument at that particular time. An FGS consists of a set of gimbaled mirrors constructed so that any star within its FOV can be placed on an image dissector/interferometer combination. The encoder readings of the gimbaled mirror axes supply the object position in the FOV; the output of each of the pairs of interferometers supplies a fine error signal. Each sensor contains a set of movable filters, plus temperature, voltage, and other monitors. The astrometry experimenter observes stars in an approximate magnitude range of 4 to 17. Relative positions of stars can be measured with a precision of 0.002 arc-s.

------- HST, MACCHETTO--

INVESTIGATION NAME- FAINT-OBJECT CAMERA

NSSDC ID- LST -08 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

TL - F.D.	MACCHETTO	SPACE TELESCOPE SCI IN
TM - H.C.	VAN DE HULST	HUYGENS LAB
TM - I.R.	KING	U OF CALIF, BERKELEY
TM - P.	CRANE	EUROP SO OBS, MUNICH
TM - R.	ALBRECHT	EUROP ST COORD FACIL
TM - C.	BARBIERI	INST DI ASTRONOMIA
TM - A.	BOKSENBERG	ROYAL OBS
TM - M.J.	DISNEY	U COLLEGE CARDIFF
TM - T.M.	KAMPERMAN	ASTRONOMICAL INST
TM - C.D.	MACKAY	U OF CAMBRIDGE
TM - R.N.	WILSON	EUROP SO OBS, SWIZR
TM - J.M.	DEHARVENG	CNRS-LAS
TM - J.C.	BLADES	SPACE TELESCOPE SCI IN
TM - P.	JAKOBSEN	ESA-ESTEC
TM - F.	PARESCE	SPACE TELESCOPE SCI IN
TM - G.	WEIGELT	U OF ERLANGEN

BRIEF DESCRIPTION
The faint-object camera (FOC), which operates at a high focal ratio, uses an imaging camera with a two-dimensional photon-event counting detector, and is able to detect objects that are 50 times fainter than those observable with the most powerful earthbased telescope. The FOC has a minimum format of 64 by 64 pixels. Based on a pixel size of 25 by 25 micrometers, a focal ratio of approximately f/96 is required to exploit the spatial resolving power of the HST. At that focal ratio, the pixel size is 0.022 by 0.022 arc-s. For imagery and photometry of very faint stars and extended sources, cumulative exposures are required to obtain a useful signal-to-noise ratio. The FOC wavelength range is 1200 to 7000 A. The observable range for point sources is from 21st to 28th visual magnitude, and for extended sources is the equivalent of from 15th to 22nd visual magnitude over an area of one sq arc-s.

------- HST, WESTPHAL--

INVESTIGATION NAME- WIDE-FIELD CAMERA

NSSDC ID- LST -07 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - J.A.	WESTPHAL	CALIF INST OF TECH
OI - W.A.	BAUM	LOWELL OBSERVATORY
OI - D.G.	CURRIE	U OF MARYLAND
OI - G.E.	DANIELSON	CALIF INST OF TECH
OI - B.A.	SMITH	U OF ARIZONA
OI - A.D.	CODE	U OF WISCONSIN
OI - J.E.	GUNN	PRINCETON U
OI - J.	KRISTIAN	CALIF INST OF TECH
OI - C.R.	LYNDS	KITT PEAK NATL OBS
OI - P.K.	SEIDELMANN	US NAVAL OBSERVATORY

BRIEF DESCRIPTION
The wide-field and planetary camera (WF/PC) investigation uses two cameras of different focal lengths housed in a single radial bay. One is a wide-field camera and the other is a planetary camera. Each camera uses a simple optical mosaic technique in conjunction with four charge-coupled devices (CCD) as detectors, each having 800 by 800 picture elements. The CCDs are thinned for back-side illumination, and their spectral responses are extended from the visible to the vacuum ultraviolet by special processing. The overall quantum efficiency of the instrument exceeds 5% from Lyman alpha (121.6 nm) to 350 nm, rising to about 30% from 450 to 800 nm, then gradually decreasing into the infrared. The combination of the optical mosaic and CCD detectors provides a contiguous field with an overall size of 1600 by 1600 pixels. Focal ratios of f/12.9 and f/30 give field sizes of 2.67 sq arc-min at a resolution of 0.1 arc-s/pixel for the wide-field camera and 68.7 sq arc-s at 0.043 arc-s/pixel for the planetary camera. The instrument contains space for 50 filters as well as polarizers/filters and transmission gratings.

**************************** INSAT-1C ****************************

SPACECRAFT COMMON NAME- INSAT-1C
ALTERNATE NAMES- INDIAN NATIONAL SAT.

NSSDC ID- INSAT1C

LAUNCH DATE- 06/00/86 WEIGHT- 1152. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
INDIA ISRO

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 1436. MIN INCLINATION- 0.0 DEG
PERIAPSIS- 36000. KM ALT APOAPSIS- 36000. KM ALT

PERSONNEL

MG - J.P.	SINGH	ISRO SATELLITE CENTER
PM - P.P.	KALE	INDIA DEPT OF SPACE

BRIEF DESCRIPTION
The Insat-1C is the third spacecraft in the first generation Indian National Satellite system. The geostationary (at 94 deg E), three-axis stabilized spacecraft is functionally identical to Insat 1A and 1B, and is designed to provide combined telecommunications, direct TV broadcast, and meteorological service to India's civilian community over a 7-year-in-orbit life span. The telecommunications package provides two-way, long-distance telephone circuits and direct radio and TV broadcasting to the remotest areas of India. The meteorology package is comprised of a scanning very-high-resolution, two-channel radiometer (VHRR) to provide full-frame, full-earth coverage every 30 min. The visual channel (0.55-0.75 micrometers) has a 2.75-km resolution while the IR channel (10.5-12.5 micrometers) has an 11-km resolution. Using the Insat TV capability, early warnings of impending disasters (i.e., floods, storms, etc.) can directly reach the civilian population, even in remote areas. The Insat-1C also has a data channel for relaying meteorological, hydrological, and oceanographic data from unattended land-based or ocean-based data collection and transmission platforms.

------- INSAT-1C, IMD STAFF--

INVESTIGATION NAME- VERY HIGH RESOLUTION RADIOMETER (VHRR)

NSSDC ID- INSAT1C-01 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - IMD STAFF INDIA METEOROLOG. DEPT

BRIEF DESCRIPTION
The Very High Resolution Radiometer (VHRR) is a two-channel scanning instrument. Both channels give full earth coverage with a full frame image every 30 min. The visible channel (10.5-12.5 micrometers) has a 2.75-km resolution, and the IR channel has an 11-km resolution. The half-hourly observations are used for monitoring weather systems over land and sea, i.e., observing cyclones and measuring sea surface and cloud top temperatures.

------- INSAT-1C, IMD STAFF--

INVESTIGATION NAME- DATA COLLECTION AND TRANSMISSION
RELAY PACKAGE

NSSDC ID- INSAT1C-03 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
COMMUNICATIONS

ORIGINAL PAGE IS
OF POOR QUALITY

PI - IMD STAFF INDIA METEOROLOG. DEPT

BRIEF DESCRIPTION
The data collection and transmission relay package consists of a data channel operating at 402.75 MHz (earth-to-satellite) to provide for the relay of meteorological, hydrological, and oceanographic data from unattended land-based and ocean-based data collection and transmission platforms.

------- INSAT-1C, P & T STAFF--

INVESTIGATION NAME- TELECOMMUNICATIONS PACKAGE

NSSDC ID- INSAT1C-02 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS

PERSONNEL
PI - P & T STAFF INDIA POSTS & TELE DEP

BRIEF DESCRIPTION
The telecommunications package has 12 transponders operating at 5935-6425 MHz (earth-to-satellite) and 3710-4200 MHz (satellite-to-earth) for thick route, thin route, and remote area communication and TV distribution. It also has two transponders operating at 5855-5935 MHz (earth-to-satellite) and 2555-2635 MHz (satellite-to-earth) for direct broadcasting to augment low-cost community TV sets in rural areas, radio-program distribution, national TV networking and disaster warning.

************************** IRS-1A**************************

SPACECRAFT COMMON NAME- IRS-1A
ALTERNATE NAMES- INDIAN REMOTE SENSNG SAT

NSSDC ID- IRS-1A

LAUNCH DATE- 00/00/86 WEIGHT- 850. KG
LAUNCH SITE- UNKNOWN, U.S.S.R.
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
INDIA ISRO

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 103.2 MIN INCLINATION- 99. DEG
PERIAPSIS- 904. KM ALT APOAPSIS- 904. KM ALT

PERSONNEL
PD - K. KASTURIRANGAN ISRO SATELLITE CENTER
PS - R.R. NAVALGUND SPACE APPLICATIONS CTR
PS - V. JAYARAMAN ISRO SATELLITE CENTER

BRIEF DESCRIPTION
The Indian Remote Sensing Satellite-1A (IRS-1A) is the first of a series of semi-operational/operational remote sensing satellites developed by India for land-based applications such as agriculture, forestry, geology, and hydrology. The three-axis-stabilized sun-synchronous satellite carries two linear imaging self-scanned sensors (LISS) which perform "pushbroom" scanning in visible and near IR bands to acquire images of the earth. Local equatorial crossing time is fixed at around 10 a.m. The spacecraft platform, measuring 1.56 m x 1.66 m x 1.10 m, has the payload module attached on the top and a deployable solar array stowed on either side. Attitude control is provided by four momentum wheels, two magnetic torquers, and a thruster system. Together they give an estimated accuracy of better than plus or minus 0.10 deg in all three axes. Further information can be found in "The Indian Remote Sensing Satellite: a Program Overview", Proc. Indian Acad. Sci., v. 6, pp. 313-336, 1983, by R. R. Navalgund and K. Kasturirangan.

------- IRS-1A, ISRO STAFF--

INVESTIGATION NAME- LINEAR IMAGING SELF-SCAN SENSORS
(LISS I & II)

NSSDC ID- IRS-1A -01 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
OCEANOGRAPHY
EARTH RESOURCES SURVEY

PERSONNEL
PI - ISRO STAFF ISRO

BRIEF DESCRIPTION
The IRS-1A Linear Imaging Self-Scanned Sensors (LISS) provide repetitive multispectral images of the earth's surface on a global basis for earth resources studies. One type of sensor is designated as LISS-I, which yields a low spatial resolution of 73 m. The other type, LISS-II, has two identical cameras, each of which has a medium resolution of 37 m. Both types of push-broom scanning sensors operate in the four spectral bands: 0.45-0.52, 0.52-0.59, 0.62-0.68, and 0.77-0.86 linear array of detectors of the charge-coupled device (CCD) type with 2048 elements, which are located in the focal plane of the system. The along-track scan is produced by the orbital motion of the spacecraft. The instantaneous field of view for LISS-I is 80 microradians and the swath width is 148 km; for LISS-II they are each 40 microradians and 74 km, respectively. Data from both LISS-I and LISS-II are transmitted in real time to the data reception system at the National Remote Sensing Agency, Hyderabad, India.

************************** ISO**************************

SPACECRAFT COMMON NAME- ISO
ALTERNATE NAMES- INFRARED SPACE OBSERV.

NSSDC ID- ISO

LAUNCH DATE- 00/00/92 WEIGHT- 1800. KG
LAUNCH SITE- UNKNOWN, U.S.S.R.
LAUNCH VEHICLE- ARIANE II

SPONSORING COUNTRY/AGENCY
U.S.S.R. ESA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 720. MIN INCLINATION- 5.25 DEG
PERIAPSIS- 1000. KM ALT APOAPSIS- 39000. KM ALT

PERSONNEL
PM - UNKNOWN
PS - UNKNOWN

BRIEF DESCRIPTION
The Infrared Space Observatory (ISO) is designed to provide detailed infrared properties of selected Galactic and extragalactic sources. The sensitivity of the telescopic system is about one thousand times superior to that of the Infrared Astronomical Satellite (IRAS), since the ISO telescope enables integration of infrared flux from a source for several hours. Density waves in the interstellar medium, its role in star formation, the giant planets, asteroids, and comets of the solar system are among the objects of investigation. The telescope has a Ritchey-Chretien configuration, with an aperture of 60 cm and an overall f-ratio of 15. The primary and secondary mirrors are made of fused silica. The field of view of the telescope is 20 arc-min and the pointing accuracy is 5 arc-s. The collected flux in the wavelength range of 2-120 micrometers is channeled to one of the four detecting instruments, as desired. The observatory contains two 750-L tanks of liquid hydrogen and liquid helium to cool the detectors. Science data will be obtained for 10 h during each orbit and telemetered in real-time, at a rate of 44 kbps. The operating lifetime of the observatory is 18 months.

------- ISO, UNKNOWN--

INVESTIGATION NAME- INFRARED SPECTROMETRY

NSSDC ID- ISO -01 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
ASTRONOMY

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
The infrared spectrometers are two identical instruments. Each instrument covers one of the two bands in the total range of 2-70 micrometers. Each utilizes a rapid-scan Michelson interferometer and cryostatically cooled detectors. The resolving power can be varied from 1.E2 to 1.E5. Either spectrometer can be aimed to the focal plane volume of a commonly shared 60-cm aperture Ritchey-Chretien telescope.

------- ISO, UNKNOWN--

INVESTIGATION NAME- INFRARED PHOTOMETER/POLARIMETER

NSSDC ID- ISO -02 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
ASTRONOMY

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
The infrared photometer/polarimeter utilizes cryostatically cooled silicon and germanium photodetectors, and covers the range of 8-120 micrometers in four bands. The instrument can be aimed to the focal plane volume of a commonly shared 60-cm aperture Ritchey-Chretien telescope.

NSSDC ID- ISO -03

INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
ASTRONOMY

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
The infrared camera array photographs infrared sources in the Galaxy and the universe, through a set of fixed-band filters and a continuously variable filter, covering the range of 2-5 micrometers. It utilizes a 32 by 32 array of cryostatically cooled InSb detectors. The camera can be aimed to the focal plane volume of a commonly shared 60-cm aperture Ritchey-Chretien telescope.

**************************** ISTP/EQUATOR ****************************

SPACECRAFT COMMON NAME- ISTP/EQUATOR
ALTERNATE NAMES- EML, EQ. MAGNETOSPHERE LAB.

NSSDC ID- EQUATOR

LAUNCH DATE- 02/00/91 WEIGHT- 916. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHTLE-PAMD

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 1560. MIN INCLINATION- 0. DEG
PERIAPSIS- 6000. KM ALT APOAPSIS- 70000. KM ALT

PERSONNEL

MG - D.S.	DILLER	NASA HEADQUARTERS
SC - M.J.	WISKERCHEN	NASA HEADQUARTERS
PM - K.O.	SIZEMORE	NASA-GSFC
PS - J.K.	ALEXANDER	NASA-GSFC
PS - M.H.	ACUNA	NASA-GSFC
PS - M.L.	KAISER	NASA-GSFC

BRIEF DESCRIPTION
EQUATOR is one of the four spacecraft in the ISTP (International Solar Terrestrial Physics) program. (Two additional spacecraft may be launched.) The ISTP program is a major new thrust in the study of solar-terrestrial relationships. Its goal, to obtain the first quantitative assessment of the global flow of energy through the earth's space environment above the upper atmosphere, is accomplished with a network of four spacecraft orbiting in key locations around the earth: two plasma source regions and two geospace storage regions. With a properly instrumented spacecraft laboratory in each of the four regions, simultaneous observations can be made of the entry of plasma into the system, the storage and release of energy within the system, and the transfer of plasma and energy between those key regions as they change with time. Complementary programs being planned for the same time frame are the ULYSSES (formerly, ISPM) and the UARS (Upper Atmosphere Research Satellite) program. The ISTP program is designed to achieve three major scientific goals: (1) to assess the mass, momentum and energy flow and their time variability throughout the geospace environment; (2) to improve the understanding of plasma processes that control the collective behavior of geospace components and trace their cause-and-effect relationships through the system; and (3) to assess the importance to the terrestrial environment of variations in energy input to the atmosphere caused by geospace processes. The program has a flexible central data handling facility to which the investigators gain access by remote computer terminals. The spacecraft laboratories are launched from the Space Shuttle, with a PAM-D upper stage for final orbit insertion. Each has onboard propulsion systems and ample fuel supplies to achieve and maintain its specific orbit. Spacecraft design lifetime is 3-5 years, with redundant subsystems. All of the spacecraft are cylindrical, approximately 2.8 m in diameter by 1.25 m high (plus 1.25 m for its despun platform), with body-mounted solar cell arrays, and are spin-stabilized. They have long wire spin-plane antennas, inertia booms, and spin-plane appendages to support sensors. The spacecraft are non-retrievable and non-serviceable. This particular spacecraft, EQUATOR, measures solar wind entry at the sunward nose of the magnetosphere, and the transport and storage of plasma in the equatorial ring current and near-earth plasma sheet. Data are stored using onboard tape recorders and relayed to the Deep Space Network at a high rate, although the average real-time data rate for EQUATOR is 22.2 kbps. There is a despun gimballed instrument platform on one end. EQUATOR will be in a 26-h equatorial orbit with perigee and apogee of 2,400 by 70,000 km. It weighs 916 kg and uses 306 W of power. The spin rate is 10 rpm around an axis lying in the orbit plane and maintained within 30 deg of normal to the earth-sun line.

NSSDC ID- EQUATOR-03

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - J.L.	BURCH	SOUTHWEST RES INST
CI - J.D.	WINNINGHAM	SOUTHWEST RES INST
CI - E.G.	SHELLEY	LOCKHEED PALO ALTO
CI - P.H.	REIFF	RICE U
CI - A.D.	JOHNSTONE	MULLARD SPACE SCI LAB
CI - H.	EJIRI	ISAS

BRIEF DESCRIPTION
This investigation is designed to study definitively (1) the composition of magnetospheric plasma storage regions, (2) the entry of solar wind plasma into the magnetosphere, (3) the injection of ionospheric plasma into the magnetosphere, (4) magnetospheric plasma transport and acceleration, (5) the role of minor ionic constituents in magnetospheric plasma processes, (6) species-dependent magnetospheric ion loss mechanisms, e.g., wave-particle interactions and charge exchange, (7) the physics of heavy ions and multi-component plasmas, and (8) magnetotail composition phenomena (during the deep tail extended-mission phase of EQUATOR). The instrument consists of a toroidal ion mass spectrograph (TIMS). This instrument has a mass per charge range of 1 to 150 u/Q in 128 channels, with resolution (M/delta M) of 10, and an energy range of 0 to 40 keV/Q, with 32 energy steps logarithmically spaced and a resolution (delta E/E) of 0.08. The field of view covers 10 deg of azimuth and plus and minus 20 deg in elevation, with five elements of 8 deg each in elevation. The sample rate of 32 samples per second yields one mass-energy-angle spectrum per 4 spin periods. This instrument is identical to the instrument on ISTP/POLAR.

------- ISTP/EQUATOR, CHAPPELL------------------------------------

INVESTIGATION NAME- COLD PLASMA IONS (TIDE)

NSSDC ID- EQUATOR-09

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS
INTERPLANETARY PHYSICS

PERSONNEL

PI - C.R.	CHAPPELL	NASA-MSFC
CI - D.L.	REASONER	NASA-MSFC
CI - N.H.	STONE	NASA-MSFC
CI - J.L.	GREEN	NASA-MSFC
CI - J.H.	HOFFMAN	U OF TEXAS, DALLAS
CI - W.B.	HANSON	U OF TEXAS, DALLAS
CI - R.A.	HEELIS	U OF TEXAS, DALLAS
CI - P.M.	BANKS	STANFORD U
CI - W.J.	RAITT	UTAH STATE U
CI - A.F.	NAGY	U OF MICHIGAN
CI - W.E.	SHARP	U OF MICHIGAN
CI - J.L.	HORWITZ	U OF ALABAMA
CI - R.H.	COMFORT	U OF ALABAMA
CI - J.J.	BERTHELIER	CRPE, CNRS-CNET
CI - R.E.	GENDRIN	CNET

BRIEF DESCRIPTION
This investigation, TIDE (thermal ion dynamics experiment), is designed to study the origin, transport, energization, storage, and loss of low energy ions in the earth's magnetosphere. The instrument measures the distribution function of ions in the energy range 0-100 eV and the mass range 1 to 16 u. A complete ion distribution is obtained over each spin of the spacecraft (nominally 6 s). The instrument consists of two sensor assemblies and an electronics assembly. The two sensors are mounted on opposite edges of the spacecraft, and each has a field of view of 170 deg. Control of the instrument by an onboard microprocessor permits programmable sequences of angle, energy, and mass to be selected for specific studies. The angular acceptance is in 10 x 10 deg windows covering a 120-deg fan in the plane containing the spin axis, and in 2 x 2 deg windows on 4-deg centers covering a 30-deg fan in the plane containing the spin axis. Energy resolution is nominally 20%, and mass resolution is 25% for masses 1-4 u, 8% for masses 4-16 u, and 3% for masses 16-64 u.

------- ISTP/EQUATOR, FRITZ------------------------------------

INVESTIGATION NAME- CHARGE AND MASS MAGNETOSPHERIC ION COMPOSITION EXPERIMENT (CAMMICE)

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OF POOR QUALITY

NSSDC ID- EQUATOR-04

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - T.A.	FRITZ	LOS ALAMOS NAT LAB
CI - J.B.	BLAKE	AEROSPACE CORP
CI - J.F.	FENNELL	AEROSPACE CORP
CI - D.A.	BRYANT	RUTHERFORD APPLETON L.
CI - B.K.G.	HULTQVIST	KIRUNA GEOPHYS INST
CI - G.	KREMSER	MPI-AERONOMY
CI - W.	STUDEMANN	MPI-AERONOMY
CI - B.	WILKEN	MPI-AERONOMY
CI - P.R.	HIGBIE	LOS ALAMOS NAT LAB
CI - W.N.	SPJELDVIK	NOAA-SEL
CI - D.J.	WILLIAMS	APPLIED PHYSICS LAB
CI - T.	DOKE	WASEDA U
CI - J.M.	CORNWALL	AEROSPACE CORP
CI - M.	SCHULZ	AEROSPACE CORP
CI - C.K.	GOERTZ	U OF IOWA
CI - V.M.	VASYLIUNAS	MPI-AERONOMY
CI - L.R.	LYONS	NOAA-SEL

BRIEF DESCRIPTION

The objectives of this investigation, CAMMICE, (charge and mass magnetospheric ion composition experiment), are the unambiguous determination of the composition of the earth's plasma populations, their original sources, and the mechanisms acting to energize and transport these populations within the closely coupled magnetosphere/ionosphere and magnetosphere/solar-wind systems, and in the two major geospace energy storage reservoirs: the near-earth plasma sheet and the ring current. The CAMMICE incorporates two types of sensor systems, MICS and HIT, which each perform a three-parameter measurement on the ion composition over a combined range from <10 keV/Q to 15 MeV/Q for elements from hydrogen through iron. Each of the sensor systems is supported by its own independent data processing unit. The MICS sensor is mounted on a scan platform. These sensors are identical to those flown on the ISTP/POLAR spacecraft, although the mountings are different.

------- ISTP/EQUATOR, GURNETT--------------------------------

INVESTIGATION NAME- PLASMA WAVES

NSSDC ID- EQUATOR-08

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - D.A.	GURNETT	U OF IOWA
CI - J.K.	ALEXANDER, JR.	NASA-GSFC
CI - M.L.	KAISER	NASA-GSFC
CI - C.K.	GOERTZ	U OF IOWA
CI - R.R.	SHAW	U OF IOWA
CI - R.R.	ANDERSON	U OF IOWA
CI - S.D.	SHAWHAN	U OF IOWA
CI - F.L.	SCARF	TRW SYSTEMS GROUP
CI - H.	MATSUMOTO	KYOTO U
CI - B.T.	TSURUTANI	NASA-JPL

BRIEF DESCRIPTION

The objectives of this investigation are to determine the role of wave-particle interactions in the plasma processes which occur in the distant geomagnetic tail and to evaluate the consequences of these interactions. The electric field sensors consist of two orthogonal electric dipoles with a nominal tip-to-tip length of 100 m, and the magnetic field sensors consist of a triaxial search-coil magnetometer. The instrumentation consists of (1) a sweep-frequency receiver for high frequency resolution spectrum measurements, (2) a multichannel spectrum analyzer for high time resolution spectrum measurements, and (3) a wideband waveform receiver for obtaining wideband frequency-time spectra and multi-antenna cross-correlation measurements over selected time periods. The sweep-frequency receiver covers the range 12 Hz to 400 kHz for the electric antenna and 12 Hz to 6.25 kHz for the magnetic antenna. The spectrum analyzer covers 5.6 Hz to 311 kHz for the electric antenna and 5.6 Hz to 1.0 kHz for the magnetic. The wideband waveform receiver covers three bands, 10 to 250 Hz, 50 Hz to 2 kHz, and 500 Hz to 16 kHz. The low-frequency waveform receiver has five simultaneous channels, 0.1-10 Hz. The sampling of the instrumentation is controlled by two microprocessors which can be reprogrammed in flight. The instrument also provides signals to other instruments indicating the occurrence of specific types of plasma wave events.

------- ISTP/EQUATOR, HIGBIE--------------------------------

INVESTIGATION NAME- ENERGETIC ELECTRONS AND IONS

NSSDC ID- EQUATOR-02

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - P.R.	HIGBIE	LOS ALAMOS NAT LAB
CI - D.N.	BAKER	LOS ALAMOS NAT LAB
CI - R.D.	BELIAN	LOS ALAMOS NAT LAB
CI - W.	STUDEMANN	MPI-AERONOMY
CI - E.	KIRSCH	MPI-AERONOMY
CI - A.	KORTH	MPI-AERONOMY
CI - B.	WILKEN	MPI-AERONOMY
CI - H.D.	VOSS	LOCKHEED PALO ALTO
CI - W.L.	IMHOF	LOCKHEED PALO ALTO
CI - J.B.	REAGAN	LOCKHEED PALO ALTO
CI - J.B.	BLAKE	AEROSPACE CORP
CI - J.F.	FENNELL	AEROSPACE CORP
CI - T.A.	FRITZ	LOS ALAMOS NAT LAB
CI - D.J.	WILLIAMS	APPLIED PHYSICS LAB
CI - M.G.	KIVELSON	U OF CALIF, LA

BRIEF DESCRIPTION

This investigation, CEPPAD (comprehensive energetic particle pitch angle distribution), is designed to provide detailed pitch angle measurements of energetic particle fluxes, to cover the particle energy spectra over as wide a range as possible with statistically meaningful results, to separately identify ions and electrons, and to give information on high energy ion composition. This instrument is identical to the one flown on ISTP/POLAR. The instrument measures electrons with energies from 20 keV to 3 MeV and protons with energies from 20 keV to 17 MeV. Alpha particles and the CNO group of nuclei are also uniquely identified with high time resolution in broad energy bands over the range 300 to 3300 keV/nucleon. Multiple detector heads on the body-mounted portion of the instrument provide detailed high-resolution three-dimensional measurement of the energetic particle distribution function at all angles outside the loss cone. The detectors mounted on the scan platform are designed to look along the local magnetic field direction. The major components of the body-mounted detectors (BEPS) are the three sensor types LEMS, HIST, and DPU. The scan-platform energetic-particle spectrometers (SEPS) are divided into three different spectrometers designated HARE, HARP, and HISS. Both the BEPS and the SEPS are controlled by microprocessors.

------- ISTP/EQUATOR, MAYNARD--------------------------------

INVESTIGATION NAME- ELECTRIC FIELDS: BURST MODE

NSSDC ID- EQUATOR-05

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - N.C.	MAYNARD	USAF GEOPHYS LAB
CI - T.L.	AGGSON	NASA-GSFC
CI - J.P.	HEPPNER	NASA-GSFC
CI - C.G.	FALTHAMMAR	ROYAL INST OF TECH
CI - L.P.	BLOCK	ROYAL INST OF TECH
CI - F.S.	MOZER	U OF CALIF, BERKELEY
CI - R.B.	TORBERT	U OF CALIF, SAN DIEGO
CI - W.J.	BURKE	USAF GEOPHYS LAB
CI - M.	SMIDDY	USAF GEOPHYS LAB
CI - A.	PEDERSEN	ESA-ESTEC
CI - K.	KNOTT	ESA-ESTEC
CI - R.J.L.	GRARD	ESA-ESTEC
CI - D.P.	STERN	NASA-GSFC
CI - A.	NISHIDA	ISAS
CI - K.	TSURUDA	ISAS

BRIEF DESCRIPTION

The major objectives of this investigation are (1) to study the extent and variability of convection electric fields in the magnetosphere, (2) to determine the electric-field structure of the magnetopause and the energy dissipated at that boundary, (3) to understand the relationship between convection electric fields and inductive electric fields generated by magnetic activity and the causes of strong turbulence in the electric field during magnetically active times, (4) to study plasmapause dynamics including the degree of penetration into the plasmasphere of the convection electric field, and (5) to determine the degree of electrical coupling and the extent of electrical mapping between different regions of the magnetosphere through comparison of electric field measurements at different points along a common boundary, within the same magnetic field line regions or in different regions of the magnetosphere (with the aid of the other spacecraft in the ISTP program). The instrument consists of three orthogonal double probes, each of which is a pair of separated conductors whose potential difference is measured. One pair consists of spheres located in the satellite spin plane and separated by 160 m at the ends of wire booms. A second pair consists of cylindrical wire boom elements located in the spin plane and separated by an effective distance of 350 m. The third pair consists of spheres that are oriented parallel to the satellite spin axis and are separated by 14 m at the ends of rigid booms.

------- ISTP/EQUATOR, MCILWAIN--------------------------------

INVESTIGATION NAME- ELECTRIC FIELD INVESTIGATION BY ELECTRON DRIFT STUDIES (EFIELDS)

NSSDC ID- EQUATOR-07

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - C.E.	MCILWAIN	U OF CALIF, SAN DIEGO
CI - G.	HAERENDEL	MPI-EXTRATERR PHYS
CI - F.	MELZNER	MPI-EXTRATERR PHYS
CI - D.P.	CAUFFMAN	LOCKHEED PALO ALTO
CI - R.	GREENWALD	APPLIED PHYSICS LAB
CI - R.W.	FILLIUS	U OF CALIF, SAN DIEGO
CI - J.	QUINN	U OF CALIF, SAN DIEGO
CI - E.C.	WHIPPLE, JR.	U OF CALIF, SAN DIEGO
CI - R.B.	TORBERT	U OF CALIF, SAN DIEGO
CI - F.	MELZNER	M -EXTRATERR PHYS
CI - B.	HAUSLER	MP EXTRATERR PHYS
CI - G.	PASCHMANN	MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

The objective of this investigation is to accurately measure the vector electric field in the earth's neighborhood using a method of test electrons that is inherently immune to spacecraft interference. This technique is used to study (1) the spatial and temporal characteristics of the convective electric field near the equatorial plane; (2) the physical processes at play near the magnetopause, plasma sheet, and plasmapause; (3) the instabilities associated with low-frequency plasma turbulence; (4) resonance of low-frequency waves with ions in the equatorial magnetosphere; and (5) acceleration processes associated with substorms, auroras, and ring current particle energization. The instrument measures the vector electric field at a nominal rate of 32 times per second, with burst-interval sampling at 100 times per second. Three electron guns and a detector system are used, controlled by a microprocessor. Information from the onboard magnetometer is utilized in selecting electron beam directions.

------- ISTP/EQUATOR, MCPHERRON--------------------------------

INVESTIGATION NAME- MAGNETIC FIELDS

NSSDC ID- EQUATOR-06

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - R.L.	MCPHERRON	U OF CALIF, LA
CI - W.	BAUMJOHANN	U OF MUNSTER
CI - N.U.	CROOKER	U OF CALIF, LA
CI - M.G.	KIVELSON	U OF CALIF, LA
CI - E.W.	GREENSTADT	TRW SYSTEMS GROUP
CI - W.J.	HUGHES	BOSTON U
CI - S.	KOKUBUN	U OF TOKYO
CI - J.V.	OLSON	U OF ALASKA

BRIEF DESCRIPTION

The major objective of this investigation is to study the process of energy extraction, transport, storage, and release as it is evidenced through changes in the magnetic field. The instrument consists of dual triaxial magnetometers with flippers. Dual microprocessors and random access memory are used to process the data so that the data sent to earth are immediately usable by all ISTP program investigators without extensive calculations, as well as available on board the spacecraft to other instruments in final corrected form. One million bits of internal storage under microprocessor control provide snapshots with up to 4-ms resolution on command or triggered by changes in the data. The instrument ranges are plus and minus 256, 4096, and 65,536 nT, with corresponding resolutions of 0.004, 6.06, and 1 nT, respectively.

------- ISTP/EQUATOR, PARKS--------------------------------

INVESTIGATION NAME- HOT PLASMA

NSSDC ID- EQUATOR-01

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - G.K.	PARKS	U OF WASHINGTON
CI - B.H.	MAUK	U OF WASHINGTON
CI - C.S.	LIN	U OF WASHINGTON
CI - C.W.	CARLSON	U OF CALIF, BERKELEY
CI - H.	REME	CESR

BRIEF DESCRIPTION

This investigation is designed to study both macroscopic and microscopic phenomena of the distant magnetosphere, interplanetary space and the ionosphere. The physics of large-scale geophysical phenomena are studied by coordinating the observations with those of the WIND, POLAR and GEOTAIL spacecraft. Microscopic processes are studied using in situ plasma distribution measurements. High resolution three-dimensional distributions of ions and electrons are obtained by symmetric hemispherical electrostatic analyzers with 360-deg fields of view. An ion and electron detector set is mounted on opposite ends of two inertial booms. An identical but completely separate ion and electron detector set is mounted on the despun platform. Both the body-mounted and the despun detector systems are microprocessor controlled. The energy range covered is 5 to 40 keV.

**************************** ISTP/GEOTAIL ********************

SPACECRAFT COMMON NAME- ISTP/GEOTAIL
ALTERNATE NAMES- GTL, GEOMAGNETIC TAIL LAB.

NSSDC ID- GEOTAIL

LAUNCH DATE- 03/00/91 WEIGHT- 757. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHTLE-PAMD

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 118000 MIN INCLINATION- 23.5 DEG
PERIAPSIS- 13000. KM ALT APOAPSIS- 1.5E6 KM ALT

PERSONNEL

MG - D.S.	DILLER	NASA HEADQUARTERS
SC - M.J.	WISKERCHEN	NASA HEADQUARTERS
PM - K.O.	SIZEMORE	NASA-GSFC
PS - J.K.	ALEXANDER	NASA-GSFC
PS - L.F.	BURLAGA	NASA-GSFC
PS - M.L.	KAISER	NASA-GSFC

BRIEF DESCRIPTION

GEOTAIL is one of the four spacecraft in the ISTP (International Solar Terrestrial Physics) program. (Two additional spacecraft may be launched.) The ISTP program is a major new thrust in the study of solar-terrestrial relationships. Its goal, to obtain the first quantitative assessment of the global flow of energy through the earth's space environment above the upper atmosphere, is accomplished with a network of four spacecraft orbiting in key locations around the earth: two plasma source regions and two geospace storage regions. With a properly instrumented spacecraft laboratory in each of the four regions, simultaneous observations can be made of the entry of plasma into the system, the storage and release of energy within the system, and the transfer of plasma and energy between those key regions as they change with time. Complementary programs being planned for the same time frame are the ULYSSES (formerly, ISPM) and the UARS (Upper Atmosphere Research Satellite) program. The ISTP program is designed to achieve three major scientific goals: (1) to assess the mass, momentum and energy flow and their time variability throughout the geospace environment; (2) to improve the understanding of plasma processes that control the collective behavior of geospace components and trace their cause-and-effect relationships through the system; and (3) to assess the importance to the terrestrial environment of variations in energy input to the atmosphere caused by geospace processes. The program has a flexible central data handling faci y to which the investigators gain access by remote comp er terminals. The spacecraft laboratories are launched fr the Space Shuttle, with a PAM-D upper stage for final orbit insertion. Each has onboard propulsion systems and ample fuel supplies to achieve and maintain its specific orbit. Spacecraft design lifetime is 3-5 years, with redundant subsystems. All of the spacecraft are cylindrical, a oximately 2.8 m in diameter by 1.25 m high, with bo -mounted solar cell arrays, and are spin-stabilized. They have long wire spin-plane antennas, inertia booms, and sp -plane appendages to support sensors. The spacecraft are non-retrievable and non-serviceable. This particular spacecraft, GEOTAIL, measures solar wind entry and acceleration, transport, and storage of plasma in the geomagnetic tail. Data are stored using onboard tape recorders and relayed to the Deep Space Network at a high rate, although the average real-time data rate for GEOTAIL is 8 kbps. GEOTAIL will be in an orbit near the ecliptic plane and uses lunar gravity assists to keep its apogee over the night hemisphere of the earth. The orbit parameters thus vary. The period is 1-4 months, p rigee is 13,000-57,000 km, and apogee is 0.1-1.5 million km (20-235 earth radii). GEOTAIL weighs 757 kg and uses 273 W of power. The spin rate is 20 rpm around an axis within 1 deg of normal to the ecliptic.

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OF POOR QUALITY

------- ISTP/GEOTAIL, FRANK------------------------------------

INVESTIGATION NAME- HOT PLASMA ND ION COMPOSITION

NSSDC ID- GEOTAIL-04 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI -	L.A.	FRANK	U OF IOWA
CI -	F.V.	CORONITI	U OF CALIF, LA
CI -	G.L.	SISCOE	U OF CALIF, LA
CI -	K.L.	ACKERSON	U OF IOWA

BRIEF DESCRIPTION
The objective of this investigation is to make comprehensive observations of the three-dimensional velocity distribution functions of electrons and positive ions, with identification of ion species. The instrument contains three sets of quadrispherical analyzers with channel electron multipliers. These three obtain three-dimensional measurements for hot plasma and solar wind electrons, for solar wind ions, and for positive-ion composition measurements. The positive-ion composition measurement includes five miniature imaging mass spectrometers at the exit aperture of the analyzer, and covers masses from 1 to 550 u/Q at 100 eV, and 1 to 55 u/Q at 10 keV. The hot plasma analyzer measures electrons and ions in the range 1-50,000 eV/Q. The solar wind analyzer measures ions from 150 to 7,000 eV/Q. Sequencing of the energy analyzers and mass spectrometers, and other control functions, are provided by two microprocessors.

------- ISTP/GEOTAIL, MOZER------------------------------------

INVESTIGATION NAME- DC ELECTRIC FIELDS

NSSDC ID- GEOTAIL-05 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI -	F.S.	MOZER	U OF CALIF, BERKELEY
CI -	R.B.	TORBERT	U OF CALIF, SAN DIEGO
CI -	W.J.	BURKE	USAF GEOPHYS LAB
CI -	M.	SMIDDY	USAF GEOPHYS LAB
CI -	R.J.L.	GRARD	ESA-ESTEC
CI -	K.	KNOTT	ESA-ESTEC
CI -	A.	PEDERSEN	ESA-ESTEC
CI -	L.P.	BLOCK	ROYAL INST OF TECH
CI -	C.G.	FALTHAMMAR	ROYAL INST OF TECH
CI -	A.	NISHIDA	ISAS

BRIEF DESCRIPTION
The objectives of this investigation are studies of (1) the large scale configuration of the electric field in the magnetotail, (2) tail electric field variations during substorms, (3) the electric field in the plasma sheet, (4) the electric field near the magnetopause and in the plasma mantle at locations tailward of those covered by similar measurements on ISEE 1, (5) micropulsation and low frequency wave measurements at frequencies covering the local gyrofrequency (<1Hz) and lower hybrid frequency (<10Hz) in the tail, (6) plasma density as deduced from measurement of the floating potential of the spacecraft, and (7) electric field comparisons (with the aid of the other spacecraft in the ISTP program) at different points along the same magnetic field line, at different points along a common boundary, or in different regions of the magnetosphere. The instrument consists of two orthogonal double probes, each of which is a pair of separated spheres on wire booms that are located in the satellite spin plane and whose difference of potential is measured. The separation distances between the pair of sensors are variable and as great as 160 m tip-to-tip. One operating mode involves length ratios of the two antennas of about 2:1 in order to verify instrument operation through showing that the electric field signature is proportional to the boom length. A second reason for two pairs of wire booms in the satellite spin plane is the requirement for measurements having a time resolution far better than the satellite spin period.

------- ISTP/GEOTAIL, SCARF------------------------------------

INVESTIGATION NAME- PLASMA WAVES

NSSDC ID- GEOTAIL-02 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI -	F.L.	SCARF	TRW SYSTEMS GROUP
CI -	J.K.	ALEXANDER, JR.	NASA-GSFC
CI -	P.	RODRIGUEZ	US NAVAL RESEARCH LAB
CI -	R.G.	STONE	NASA-GSFC
CI -	P.J.	KELLOGG	U OF MINNESOTA
CI -	H.	MATSUMOTO	KYOTO U
CI -	E.J.	SMITH	NASA-JPL
CI -	S.D.	SHAWHAN	U OF IOWA
CI -	W.S.	KURTH	U OF IOWA
CI -	M.C.	KELLEY	CORNELL U
CI -	P.M.	KINTNER	CORNELL U
CI -	R.A.	HELLIWELL	STANFORD U
CI -	W.W.L.	TAYLOR	TRW SYSTEMS GROUP

BRIEF DESCRIPTION
The objective of this investigation is to determine the dynamic behavior of the plasma trapped in the earth's magnetosphere, i.e., toroidal and poloidal currents, oscillations and waves in the plasmas, ion entrance and exit via the ionosphere and solar wind, and the extent of the plasmasheath. The instrument measures electric fields over the range 0.5 Hz to 400 kHz, and magnetic fields over the range 1 Hz to 10 kHz. Triaxial magnetic search coils are utilized in addition to a pair of electric dipole antennas. The instrument contains two sweep-frequency receivers (12 Hz to 400 kHz and 12 Hz to 6.25 kHz), a multichannel analyzer (5.6 Hz to 311 kHz for the electric antenna and 5.6 Hz to 1.0 kHz for the magnetic coils), a low frequency waveform receiver (0.01 to 10 Hz), and a wideband waveform receiver (10 Hz to 16 kHz).

------- ISTP/GEOTAIL, WILLIAMS------------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLES AND ION COMPOSITION (EPIC)

NSSDC ID- GEOTAIL-03 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI -	D.J.	WILLIAMS	APPLIED PHYSICS LAB
CI -	T.P.	ARMSTRONG	U OF KANSAS
CI -	S.M.	KRIMIGIS	APPLIED PHYSICS LAB
CI -	A.T.Y.	LUI	APPLIED PHYSICS LAB
CI -	R.W.	MCENTIRE	APPLIED PHYSICS LAB
CI -	C.I.	MENG	APPLIED PHYSICS LAB
CI -	E.C.	ROELOF	APPLIED PHYSICS LAB
CI -	L.J.	LANZEROTTI	BELL TELEPHONE LAB
CI -	E.T.	SARRIS	U OF THRACE
CI -	R.E.	GOLD	APPLIED PHYSICS LAB

BRIEF DESCRIPTION
The principal objective of the EPIC (energetic particle and ion composition) investigation is to explore the distant magnetotail region and obtain information on the origin, transport, storage, acceleration and dynamics of suprathermal and non-thermal particle populations. The instrument performs three-dimensional distribution measurements by using both total energy (LEMS -- low energy composition system) and velocity/composition detectors (ICS - ion composition system), measuring ions and electrons with energies >20 keV, and ions with energy >8 keV/nucleon, respectively. Composition measurements are made by using a thin foil time-of-flight technique which resolves the H and He isotopes, and provides elemental resolution up to approximately argon. The instrument also measures the non-thermal components to 6 MeV for protons, 480 keV for electrons, and 400 keV/nucleon for ions with Z>2. Directional measurements with a time resolution <1 s are possible.

**************************** ISTP/POLAR**********************

SPACECRAFT COMMON NAME- ISTP/POLAR
ALTERNATE NAMES- PPL, POLAR PLASMA LABORATORY

NSSDC ID- POLAR

LAUNCH DATE- 08/00/90 WEIGHT- 1088. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- SHTLE-PAMD

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 1356. MIN INCLINATION- 90. DEG
PERIAPSIS- 9000. KM ALT APOAPSIS- 56000. KM ALT

PERSONNEL

MG -	D.S.	DILLER	NASA HEADQUARTERS
SC -	M.J.	WISKERCHEN	NASA HEADQUARTERS
PM -	K.O.	SIZEMORE	NASA-GSFC
PS -	J.K.	ALEXANDER	NASA-GSFC
PS -	M.H.	ACUNA	NASA-GSFC
PS -	M.L.	KAISER	NASA-GSFC

BRIEF DESCRIPTION

POLAR is one of the four spacecraft in the ISTP (International Solar Terrestrial Physics) program. (Two additional satellites may be launched.) The ISTP program is a major new thrust in the study of solar-terrestrial relationships. Its goal, to obtain the first quantitative assessment of the global flow of energy through the earth's space environment above the upper atmosphere, is accomplished with a network of four spacecraft orbiting in key locations around the earth: two plasma source regions and two geospace storage regions. With a properly instrumented spacecraft laboratory in each of the four regions, simultaneous observations are made of the entry of plasma into the system, the storage and release of energy within the system, and the transfer of plasma and energy between those key regions as they change with time. Complementary programs being planned for the same time frame will be the ULYSSES (formerly, ISPM) and the UARS (Upper Atmosphere Research Satellite) program. The ISTP program is designed to achieve three major scientific goals: (1) to assess the mass, momentum and energy flow and their time variability throughout the geospace environment; (2) to improve the understanding of plasma processes that control the collective behavior of geospace components and trace their cause-and-effect relationships through the system; and (3) to assess the importance to the terrestrial environment of variations in energy input to the atmosphere caused by geospace processes. The program has a flexible central data handling facility to which the investigators gain access by remote computer terminals. The spacecraft laboratories are launched from the Space Shuttle, with a PAM-D upper stage for final orbit insertion. Each has onboard propulsion systems and ample fuel supplies to achieve and maintain its specific orbit. Spacecraft design lifetime will be 3-5 years, with redundant subsystems. All of the spacecraft are cylindrical, approximately 2.8 m in diameter by 1.25 m high (plus 1.25 m for its 2 despun platforms), with body-mounted solar cell arrays, and are spin-stabilized. They have long wire spin-plane antennas, inertia booms, and spin-plane appendages to support sensors. The spacecraft are non-retrievable and non-serviceable. This particular spacecraft, POLAR, measures solar wind entry, ionospheric output, and the depositions of energy into the neutral atmosphere at high latitudes. Imaging instruments make possible the measurement of visible, ultraviolet, and X-ray spectra of the polar cap. The POLAR has two despun gimballed instrument platforms, and booms are deployed out both Z axes. Data are stored on onboard tape recorders and relayed to the Deep Space Network at a high rate (600 Kb max, 250 Kb nominal), although the average real-time data rate for POLAR is 41.6 kbps. POLAR will be in a 22.6-h polar orbit (90 deg inclination), with perigee and apogee of 9,000 and 56,000 km. It weighs 1088 kg and uses 333 W of power. The spin rate is 10 rpm around an axis approximately normal to the orbit plane.

------- ISTP/POLAR, CHAPPELL -------

INVESTIGATION NAME- COLD PLASMA IONS (TIDE)

NSSDC ID- POLAR -04

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI - C.R.	CHAPPELL	NASA-MSFC
CI - D.L.	REASONER	NASA-MSFC
CI - N.H.	STONE	NASA-MSFC
CI - J.L.	GREEN	NASA-MSFC
CI - J.H.	HOFFMAN	U OF TEXAS, DALLAS
CI - W.B.	HANSON	U OF TEXAS, DALLAS
CI - R.A.	HEELIS	U OF TEXAS, DALLAS
CI - P.M.	BANKS	STANFORD U
CI - W.J.	RAITT	UTAH STATE U
CI - A.F.	NAGY	U OF MICHIGAN
CI - W.E.	SHARP	U OF MICHIGAN
CI - J.L.	HORWITZ	U OF ALABAMA
CI - R.H.	COMFORT	U OF ALABAMA
CI - J.J.	BERTHELIER	CRPE, CNRS-CNET
CI - R.E.	GENDRIN	CNET

BRIEF DESCRIPTION

This investigation, TIDE (thermal ion dynamics experiment), is designed to study the origin, transport, energization, storage, and loss of low energy ions in the earth's magnetosphere. The instrument measures the distribution function of ions in the energy range 0-100 eV and the mass range 1 to 16 u. A complete ion distribution is obtained over each spin of the spacecraft (nominally 6 s). The instrument consists of two sensor assemblies and an electronics assembly. The two sensors are mounted on opposite edges of the spacecraft, and each has a field of view of 170 deg. Control of the instrument by an onboard microprocessor permits programmable sequences of angle, energy, and mass to be selected for specific studies. The angular acceptance is in 10 x 10 deg windows covering a 120-deg fan in the plane containing the spin axis, and in 2- x 2-deg windows on 4-deg centers covering a 30-deg fan in the plane containing the spin axis. Energy resolution is nominally 20%, and mass resolution is 25% for masses 1-4 u, 8% for masses 4-16 u, and 3% for masses 16-64 u.

------- ISTP/POLAR, FELDMAN -------

INVESTIGATION NAME- MULTI-SPECTRAL AURORAL IMAGING

NSSDC ID- POLAR -10

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
UPPER ATMOSPHERE RESEARCH

PERSONNEL

PI - P.D.	FELDMAN	JOHNS HOPKINS U
CI - W.G.	FASTIE	JOHNS HOPKINS U
CI - R.W.	MCENTIRE	APPLIED PHYSICS LAB
CI - C.I.	MENG	APPLIED PHYSICS LAB
CI - T.A.	POTEMRA	APPLIED PHYSICS LAB
CI - S.I.	AKASOFU	U OF ALASKA
CI - L.J.	LANZEROTTI	BELL TELEPHONE LAB
CI - G.C.	REID	NOAA-ERL

BRIEF DESCRIPTION

The objective of this investigation is to obtain simultaneously acquired global images of the aurora with good spatial and temporal resolutions at many selected wavelengths. The instrument consists of optical sensors and associated electronics located on the imaging despun platform. There are three optical channels: far ultraviolet, near ultraviolet, and visible, each with a separate detector system consisting of an intensified CCD. The far ultraviolet channel utilizes six broadband filters covering wavelengths from 122 to 1800 A, while the near UV channel utilizes narrowband or Fabry-Perot filters at 2461, 2470, 2972, 2976, and 3371 A. The field of view is 6 deg for the far UV and 8 deg for the near UV channel, corresponding to spatial resolutions of 7 and 21 km, respectively, from 4 RE, or 40 and 120 km, respectively, from 12 RE. The nominal temporal resolution is 20 s, ranging up to 700 s for special features. Sensitivity is 1E-3 to 6E-3 counts/s per rayleigh per spatial element.

------- ISTP/POLAR, FRANK -------

INVESTIGATION NAME- OPTICAL AURORAL IMAGER

NSSDC ID- POLAR -12

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
UPPER ATMOSPHERE RESEARCH

PERSONNEL

PI - L.A.	FRANK	U OF IOWA
CI - K.L.	ACKERSON	U OF IOWA
CI - J.D.	CRAVEN	U OF IOWA
CI - P.B.	HAYS	U OF MICHIGAN
CI - W.E.	SHARP	U OF MICHIGAN

BRIEF DESCRIPTION

The major objective of this investigation is to obtain global auroral images at visible wavelengths which provide multispectral images with time resolution of 1 min, spatial resolution of 10 km at a spacecraft altitude of 9 RE, and sensitivities of 100-300 rayleighs per count in each pixel. This provides for global determination of energy deposition rates by charged particles into the earth's upper atmosphere, a global monitor of the interrelationship of major plasma regimes in the magnetosphere, a global monitor of coupling processes between the ionosphere and the magnetosphere, and a global reference system for the interpretation of in situ measurements by companion instruments in the ISTP mission. This investigation utilizes two optical channels in the visible wavelength region: a medium-resolution channel (VWM) and a low-resolution channel (VWL). The electronics subsystem is shared with the POLAR-11 investigation, as is the front-optics system used to point the instrument and to avoid the sunlit limb of the earth which is very bright in the visible. The combined instrument comprises primary and secondary optics, electromechanical devices for mirror and aperture control and filter selection, optical filters, image-intensified CCD sensor arrays with thermoelectric cooling, power converters and distribution circuits, and data, attitude and command processors. The instrument is mounted on the despun platform and normally directed in or near the nadir direction. The imaging field of view is directed by the earth-finding mirror to different sectors within the 20-x 36-deg instrument observing field. The VWL and VWM, which are part of this investigation, cover seven wavelengths from 391.0 to 732.0 nm.

------- ISTP/POLAR, FRITZ -------

INVESTIGATION NAME- CHARGE AND MASS MAGNETOSPHERIC ION COMPOSITION EXPERIMENT (CAMMICE)

NSSDC ID- POLAR -06

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI - T.A.	FRITZ	LOS ALAMOS NAT LAB
CI - J.B.	BLAKE	AEROSPACE CORP
CI - J.F.	FENNELL	AEROSPACE CORP
CI - D.A.	BRYANT	RUTHERFORD APPLETON L.
CI - B.K.G.	HULTQVIST	KIRUNA GEOPHYS INST
CI - G.	KREMSER	MPI-AERONOMY
CI - W.	STUDEMANN	MPI-AERONOMY
CI - B.	WILKEN	MPI-AERONOMY
CI - P.R.	HIGBIE	LOS ALAMOS NAT LAB
CI - D.J.	WILLIAMS	APPLIED PHYSICS LAB
CI - W.N.	SPJELDVIK	NOAA-SEL
CI - T.	DOKE	WASEDA U
CI - J.M.	CORNWALL	AEROSPACE CORP
CI - M.	SCHULZ	AEROSPACE CORP
CI - C.K.	GOERTZ	U OF IOWA
CI - V.M.	VASYLIUNAS	MPI-AERONOMY
CI - L.R.	LYONS	NOAA-SEL
CI - D.N.	BAKER	LOS ALAMOS NAT LAB
CI - J.C.	CHAVEZ	SANDIA LABORATORIES
CI - H.	BORG	KIRUNA GEOPHYS INST
CI - J.R.	CESSNA	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

The objectives of this investigation, CAMMICE (charge and mass magnetospheric ion composition experiment), are the unambiguous determination of the composition of the earth's plasma populations, their original sources, and the mechanisms acting to energize and transport these populations within the closely coupled magnetosphere/ionosphere and magnetosphere/solar-wind systems, and in the two major geospace energy storage reservoirs: the near-earth plasma sheet and the ring current. The CAMMICE incorporates two types of sensor systems, MICS and HIT, which each perform a three-parameter measurement on the ion composition over a combined range from <10 keV/Q to 15 MeV/Q for elements from hydrogen through iron. Each of the sensor systems is supported by its own independent data processing unit. These sensors are identical to those flown on the ISTP/EQUATOR spacecraft, although the mountings are different.

------- ISTP/POLAR, HIGBIE ------------------------------------

INVESTIGATION NAME- ENERGETIC ELECTRONS AND IONS

NSSDC ID- POLAR -05

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - P.R.	HIGBIE	LOS ALAMOS NAT LAB
CI - D.N.	BAKER	LOS ALAMOS NAT LAB
CI - R.D.	BELIAN	LOS ALAMOS NAT LAB
CI - W.	STUDEMANN	MPI-AERONOMY
CI - E.	KIRSCH	MPI-AERONOMY
CI - A.	KORTH	MPI-AERONOMY
CI - B.	WILKEN	MPI-AERONOMY
CI - H.D.	VOSS	LOCKHEED PALO ALTO
CI - W.L.	IMHOF	LOCKHEED PALO ALTO
CI - J.B.	REAGAN	LOCKHEED PALO ALTO
CI - J.B.	BLAKE	AEROSPACE CORP
CI - J.F.	FENNELL	AEROSPACE CORP
CI - T.A.	FRITZ	LOS ALAMOS NAT LAB
CI - D.J.	WILLIAMS	APPLIED PHYSICS LAB
CI - M.G.	KIVELSON	U OF CALIF, LA

BRIEF DESCRIPTION

This investigation, CEPPAD (comprehensive energetic particle pitch angle distribution), is designed to provide detailed pitch angle measurements of energetic particle fluxes, to cover the particle energy spectra over as wide a range as possible with statistically meaningful results, to separately identify ions and electrons, and to give information on high energy ion composition. This instrument is identical to the one flown on ISTP/EQUATOR. The instrument measures electrons with energies from 20 keV to 3 MeV and protons with energies from 20 keV to 17 MeV. Alpha particles and the CNO group of nuclei are also uniquely identified with high time resolution in broad energy bands over the range 30 to 3300 keV/nucleon. Multiple detector heads on the body-mounted portion of the instrument provide detailed high-resolution three-dimensional measurement of the energetic particle distribution function at all angles outside the loss cone. The detectors mounted on the scan platform are designed to look along the local magnetic field direction. The major components of the body-mounted detectors (BEPS) are the three sensor types LEMS, HIST, and DPU. The scan-platform energetic-particle spectrometers (SEPS) are divided into three different spectrometers designated HARE, HARP, and HISS. Both the BEPS and the SEPS are controlled by microprocessors.

------- ISTP/POLAR, IMHOF ------------------------------------

INVESTIGATION NAME- POLAR IONOSPHERIC X-RAY IMAGING EXPERIMENT (PIXIE)

NSSDC ID- POLAR -07

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
UPPER ATMOSPHERE RESEARCH

PERSONNEL

PI - W.L.	IMHOF	LOCKHEED PALO ALTO
CI - D.L.	MCKENZIE	AEROSPACE CORP
CI - C.J.	RICE	AEROSPACE CORP
CI - P.F.	MIZERA	AEROSPACE CORP
CI - W.	CALVERT	U OF IOWA
CI - D.P.	CAUFFMAN	LOCKHEED PALO ALTO
CI - J.B.	REAGAN	LOCKHEED PALO ALTO
CI - M.	WALT	LOCKHEED PALO ALTO
CI - R.R.	VONDRAK	LOCKHEED PALO ALTO
CI - T.J.	ROSENBERG	U OF MARYLAND
CI - J.G.	LUHMANN	U OF CALIF, LA
CI - J.	STADSNES	U OF BERGEN

BRIEF DESCRIPTION

The objective of this investigation is to measure the spatial distribution and temporal variations of X-ray emissions from the earth's atmosphere. The instrument consists of two major subsystems, the multiple pinhole camera and signal-processing electronics, and the digital electronics. The detector in the camera is a position-sensitive multiwire proportional counter. The signal processing electronics identify events as X-ray interactions (or not), locate the events in three-dimensional space, and determine the X-ray energy. The energy range is 1-100 keV, with spectral resolution of 15% FWHM at 6 keV (inversely proportional to the square root of the energy). The field of view is variable, 8.5, 12, 16, or 33 deg, with spatial resolution of 0.35 to 1.0 deg. Temporal resolution is 1-30 min (typically 5 min).

------- ISTP/POLAR, MOZER ------------------------------------

INVESTIGATION NAME- DC ELECTRIC FIELDS

NSSDC ID- POLAR -09

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - F.S.	MOZER	U OF CALIF, BERKELEY
CI - R.B.	TORBERT	U OF CALIF, SAN DIEGO
CI - W.J.	BURKE	USAF GEOPHYS LAB
CI - M.	SMIDDY	USAF GEOPHYS LAB
CI - R.J.L.	GRARD	ESA-ESTEC
CI - K.	KNOTT	ESA-ESTEC
CI - A.	PEDERSEN	ESA-ESTEC
CI - T.L.	AGGSON	NASA-GSFC
CI - N.C.	MAYNARD	USAF GEOPHYS LAB
CI - D.P.	STERN	NASA-GSFC
CI - L.P.	BLOCK	ROYAL INST OF TECH
CI - C.G.	FALTHAMMAR	ROYAL INST OF TECH
CI - K.	TSURUDA	ISAS

BRIEF DESCRIPTION

The objectives of this investigation are to study (1) large parallel and perpendicular electric fields in double layers and electrostatic shocks, (2) larger spatial-scale parallel electric fields responsible for upgoing ions and inverted-V electron acceleration, (3) the high latitude convection electric field, (4) the electric field structure of the high latitude magnetosphere, polar cusp, and plasma mantle, and (5) the electric field comparisons (with other spacecraft in the ISTP program) at different points along the same magnetic field line, at different points along a common boundary, or in different regions of the magnetosphere. The instrument consists of three orthogonal double probes, each of which is a pair of separated conductors whose potential difference is measured. One pair consists of spheres located in the satellite spin plane and separated by 160 m at the ends of wire booms. A second pair consists of cylindrical wire boom elements located in the spin plane and separated by an effective distance of 350 m. The third pair consists of spheres that are oriented parallel to the satellite spin axis and are separated by 14 m at the ends of rigid booms.

------- ISTP/POLAR, RUSSELL ------------------------------------

INVESTIGATION NAME- MAGNETIC FIELDS

NSSDC ID- POLAR -08

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - C.T.	RUSSELL	U OF CALIF, LA
CI - M.	ASHOUR-ABDALLA	U OF CALIF, LA
CI - P.J.	COLEMAN, JR.	U OF CALIF, LA
CI - J.G.	LUHMANN	U OF CALIF, LA
CI - F.S.	MOZER	U OF CALIF, BERKELEY
CI - P.H.	REIFF	RICE U
CI - T.	SAKURAI	TOKAI U

BRIEF DESCRIPTION

The objective of this investigation is to make high precision measurements of the magnetic field in the high and low altitude polar magnetosphere (1) to study the morphology of the polar cusp; (2) to determine the site of reconnection; (3) to investigate the behavior of field-aligned current systems at high and low altitudes: how these currents communicate stresses within the magnetosphere, and the role they play in the acceleration of particles; (4) to examine the nature of waves and instabilities in the polar cusp; (5) to investigate the cusp magnetosheath interface and determine how magnetosheath plasma gains access to the magnetosphere; and (6) to provide accurate models of the magnetic field in the high latitude magnetosphere which depend on solar wind and magnetospheric conditions. The instrument consists of dual triaxial magnetometers with flippers. Dual microprocessors and random access memory are used to process the data so that the data sent to earth are immediately usable by all ISTP program investigators without extensive calculations, as well as available on board the spacecraft to other instruments in final corrected form. One million bits of internal storage under microprocessor control provide snapshots with up to 4-ms resolution on command or triggered by changes in the data. The instrument ranges are plus and minus 256, 4096, and 65,536 nT, with corresponding resolutions of 0.004, 0.06, and 1 nT.

------- ISTP/POLAR, SCUDDER-----------------------------------

INVESTIGATION NAME- HOT PLASMA

NSSDC ID- POLAR -03

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI - J.D.	SCUDDER	NASA-GSFC
CI - T.J.	BIRMINGHAM	NASA-GSFC
CI - R.A.	HOFFMAN	NASA-GSFC
CI - E.C.	SITTLER, JR.	NASA-GSFC
CI - R.W.	FILLIUS	U OF CALIF, SAN DIEGO
CI - C.E.	MCILWAIN	U OF CALIF, SAN DIEGO
CI - E.C.	WHIPPLE, JR.	U OF CALIF, SAN DIEGO
CI - C.S.	WU	U OF MARYLAND
CI - A.	KORTH	MPI-AERONOMY
CI - A.K.	RICHTER	MPI-AERONOMY
CI - K.W.	OGILVIE	NASA-GSFC

BRIEF DESCRIPTION

The objectives of this investigation are (1) to observe the expected kinetic and magnetohydrodynamic signatures of magnetic reconnection in the cusp region, to quantify the energy released to the plasma and the rate of mass flux into the magnetosphere implied, and to understand what external parameters control the rates of reconnection of magnetic flux; (2) to understand the role of field-aligned currents in the auroral zone, their relation to auroral forms and terrestrial kilometric radiation, and their response to magnetotail and solar wind stimuli as monitored by the other ISTP program spacecraft; to ascertain the altitude dependence of the associated electrical potential and the parameters which control its size; and (3) to obtain a quantitative, high time resolution definition of the regions associated with the cusp and entry layer including a study of the momentum transfer between magnetosheath and entry layer plasmas. The instrument, named HYDRA, resolves electrons and ions, in three dimensions, with energies between 1 eV and 30 keV with 0.5-s time resolution. HYDRA consists of eight pairs of 127-deg electrostatic analyzer heads. Six pairs are body mounted, and two are on the loss cone platform.

------- ISTP/POLAR, SHAWHAN-----------------------------------

INVESTIGATION NAME- PLASMA AND RADIO WAVES

NSSDC ID- POLAR -02

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
RADIO PHYSICS
SPACE PLASMAS

PERSONNEL

PI - S.D.	SHAWHAN	U OF IOWA
CI - R.R.	ANDERSON	U OF IOWA
CI - C.K.	GOERTZ	U OF IOWA
CI - D.A.	GURNETT	U OF IOWA
CI - W.S.	KURTH	U OF IOWA
CI - B.T.	TSURUTANI	NASA-JPL
CI - T.	TEMERIN	U OF CALIF, BERKELEY
CI - J.K.	ALEXANDER, JR.	NASA-GSFC
CI - M.L.	KAISER	NASA-GSFC
CI - R.W.	FREDRICKS	TRW SYSTEMS GROUP
CI - M.C.	KELLEY	CORNELL U
CI - P.M.	KINTNER	CORNELL U
CI - C.G.	PARK	CORNELL U
CI - H.	MATSUMOTO	KYOTO U

BRIEF DESCRIPTION

The objectives of this investigation are to measure the spectrum, amplitude, and wave vector characteristics for naturally occurring electromagnetic and electrostatic plasma waves along the ISTP/POLAR trajectory for frequency ranges of 1 Hz to 400 kHz (magnetic), 1 Hz to 3.2 MHz (electric), and 1 Hz to 16 kHz (density fluctuations). The same characteristics are also measured for electromagnetic and electrostatic plasma waves resulting from ground-based or Shuttle-based active wave, particle, and chemical injection experiments. A unique feature of this instrument is the capability to recognize the presence of a desired phenomenon based on onboard microprocessor algorithms, and to capture the waveforms for six wave fields simultaneously. These waveforms provide simultaneous estimates for the electromagnetic wave normal, polarization, and Poynting vectors or for the electrostatic propagation and polarization vectors after ground processing.

------- ISTP/POLAR, SHELLEY-----------------------------------

INVESTIGATION NAME- PLASMA ION COMPOSITION

NSSDC ID- POLAR -01

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI - E.G.	SHELLEY	LOCKHEED PALO ALTO
CI - B.A.	WHALEN	NATL RES COUNC OF CAN
CI - J.L.	BURCH	SOUTHWEST RES INST
CI - W.K.	PETERSON	LOCKHEED PALO ALTO
CI - R.D.	SHARP	LOCKHEED PALO ALTO
CI - R.G.	JOHNSON	OF. OF SCI&TECH POLICY
CI - S.M.	KAYE	LOCKHEED PALO ALTO
CI - O.W.	LENNARTSSON	LOCKHEED PALO ALTO
CI - C.W.	CARLSON	U OF CALIF, BERKELEY
CI - J.	GEISS	U OF BERNE
CI - H.	BALSIGER	U OF BERNE
CI - D.T.	YOUNG	LOS ALAMOS NAT LAB
CI - A.G.	GHIELMETTI	U OF BERNE
CI - G.	PASCHMANN	MPI-EXTRATERR PHYS
CI - H.R.	ROSENBAUER	MPI-AERONOMY

BRIEF DESCRIPTION

This investigation utilizes a toroidal ion mass spectrograph (TIMS) to fulfill its objectives, which are to study (1) the properties, location, and morphology of the principal source region for the entry of solar wind plasma into the magnetosphere, i.e., the polar cusp; (2) the properties, location, and morphology of the principal source region for hot ionospheric plasma in the magnetosphere, i.e., the auroral acceleration region; (3) the details of the processes by which the source plasmas are injected into trapped orbits, with special emphasis on the mass dependence of these processes; (4) details of the processes by which relatively cool source plasmas are energized into hot plasma, with special emphasis on the mass dependence of these processes; and (5) the details of the processes by which the hot magnetospheric plasma are lost, for example through wave-particle scattering and charge exchange, with special emphasis on the mass dependence of these processes. The instrument has a mass per charge range of 1 to 150 u/Q in 128 channels, with resolution (M/delta M) of 10, and an energy range of 0 to 40 keV/Q, with 32 energy steps logarithmically spaced and a resolution (delta E/E) of 0.08. The field of view covers 10 deg of azimuth and plus and minus 20 deg in elevation, with five elements of 8 deg each in elevation. The sample rate of 32 samples per second yields one mass-energy-angle spectrum per 4 spin periods. This instrument is identical to the instrument on ISTP/EQUATOR.

------- ISTP/POLAR, TORR-----------------------------------

INVESTIGATION NAME- ULTRAVIOLET IMAGER

NSSDC ID- POLAR -11

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
UPPER ATMOSPHERE RESEARCH
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - M.R.	TORR	UTAH STATE U
CI - P.M.	BANKS	STANFORD U
CI - D.G.	TORR	UTAH STATE U
CI - J.G.	ROEDERER	U OF ALASKA
CI - K.C.	CLARK	U OF WASHINGTON
CI - B.T.	TSURUTANI	NASA-JPL
CI - J.M.	AJELLO	NASA-JPL

BRIEF DESCRIPTION

The ultraviolet imager is an ultraviolet imaging camera designed to obtain global images of the aurora at several selected wavelengths with time resolution of 1 min, spatial resolution of 10 km at a spacecraft altitude of 9 RE, and sensitivities of 100-300 rayleighs per count in each pixel. The objective is to provide coherent information on the total energy influx to the atmosphere, the characteristic energy of the precipitating particles, their spatial extent and structure, and various other parameters such as activity

indices. This investigation utilizes two UV optical channels, one in the near ultraviolet (NUV) and one in the vacuum ultraviolet (VUV). The electronics subsystem is shared with the POLAR-12 investigation, as is the front-optics system used to point the instrument and to avoid the sunlit limb of the earth which is very bright in the visible. The combined instrument comprises primary and secondary optics, electromechanical devices for mirror and aperture control and filter selection, optical filters, image-intensified CCD sensor arrays with thermoelectric cooling, power converters and distribution circuits, and data, attitude and command processors. The instrument is mounted on the despun platform and normally directed in or near the nadir direction. The imaging field of view is directed by the earth-finding mirror to different sectors within the 20-x 36-deg instrument observing field. The VUV (vacuum ultraviolet) covers six wavelengths from 120.0 to 180.0 nm, and the NUV (near ultraviolet) covers five wavelengths from 247.0 to 337.1 nm.

************************** ISTP/WIND**************************

SPACECRAFT COMMON NAME- ISTP/WIND
ALTERNATE NAMES- IPL, INTERPLAN. PHYSICS LAB.

NSSDC ID- WIND

LAUNCH DATE- 03/00/89 WEIGHT- 708. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHTLE-PAMD

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- HELIOCENTRIC
ORBIT PERIOD- 365.26 DAYS INCLINATION- 0.0 DEG
PERIAPSIS- 0.99 AU RAD APOAPSIS- 0.99 AU RAD

PERSONNEL

MG	D.S.	DILLER	NASA HEADQUARTERS
SC	M.J.	WISKERCHEN	NASA HEADQUARTERS
PM	K.O.	SIZEMORE	NASA-GSFC
PS	J.K.	ALEXANDER	NASA-GSFC
PS	L.F.	BURLAGA	NASA-GSFC
PS	M.L.	KAISER	NASA-GSFC

BRIEF DESCRIPTION

WIND is one of the four spacecraft in the ISTP (International Solar Terrestrial Physics) program. (Two additional spacecraft may be launched.) The ISTP program is a major new thrust in the study of solar-terrestrial relationships. Its goal, to obtain the first quantitative assessment of the global flow of energy through the earth's space environment above the upper atmosphere, is accomplished with a network of four spacecraft orbiting in key locations around the earth: two plasma source regions and two geospace storage regions. With a properly instrumented spacecraft laboratory in each of the four regions, simultaneous observations can be made of the entry of plasma into the system, the storage and release of energy within the system, and the transfer of plasma and energy between those key regions as they change with time. Complementary programs being planned for the same time frame are the ULYSSES (formerly, ISPM) and the UARS (Upper Atmosphere Research Satellite) program. The ISTP program is designed to achieve three major scientific goals: (1) to assess the mass, momentum and energy flow and their time variability throughout the geospace environment; (2) to improve the understanding of plasma processes that control the collective behavior of geospace components and trace their cause-and-effect relationships through the system; and (3) to assess the importance to the terrestrial environment of variations in energy input to the atmosphere caused by geospace processes. The program has a flexible central data handling facility to which the investigators gain access by remote computer terminals. The spacecraft laboratories are launched from the Space Shuttle, with a PAM-D upper stage for final orbit insertion. Each has onboard propulsion systems and ample fuel supplies to achieve and maintain its specific orbit. Spacecraft design lifetime is 3-5 years, with redundant subsystems. All of the spacecraft are cylindrical, approximately 2.8 m in diameter by 1.25 m high, with body-mounted solar cell arrays, and are spin-stabilized. They have long wire spin-plane antennas, inertia booms, and spin-plane appendages to support sensors. The spacecraft are non-retrievable and non-serviceable. This particular spacecraft, WIND, measures the incoming solar wind, magnetic fields, and particles. Data are stored using onboard tape recorders and relayed to the Deep Space Network at a high rate, although the average real-time data rate of WIND is 3.6 kbps. Experiment booms are deployed along the Z axis in both directions. WIND will be in a "halo" orbit, a 1-year heliocentric orbit, remaining near the sunward sun-earth gravitational equilibrium point, varying from 1.2 to 1.7 million km from earth. Thus it gives an approximately 1-h warning to the other ISTP spacecraft of changes in the solar wind. WIND weighs 708 kg and uses 255 W of power. The spin rate is 20 rpm around an axis within 1 deg of normal to the ecliptic. During its first 9 months of operation, WIND has an earth orbit similar to GEOTAIL, and makes magnetospheric observations before being established in its sunward "halo" orbit.

------- ISTP/WIND, BEHANNON-------------------------------------

INVESTIGATION NAME- MAGNETIC FIELDS

NSSDC ID- WIND -04 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY MAGNETIC FIELDS
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI	K.W.	BEHANNON	NASA-GSFC
CI	M.H.	ACUNA	NASA-GSFC
CI	L.F.	BURLAGA	NASA-GSFC
CI	R.J.	FITZENREITER	NASA-GSFC
CI	J.H.	KING	NASA-GSFC
CI	R.P.	LEPPING	NASA-GSFC
CI	N.F.	NESS	NASA-GSFC
CI	K.H.	SCHATTEN	NASA-GSFC
CI	F.M.	NEUBAUER	U OF COLOGNE
CI	Y.C.	WHANG	CATHOLIC U OF AMERICA

BRIEF DESCRIPTION

The primary objective of this investigation is to establish the large-scale structure and fluctuation characteristics of the interplanetary magnetic field as functions of time throughout the mission, and through correlative studies to understand the physical mechanisms by which the observed phenomena relate to the dynamics of the magnetosphere. The instrument is identical to the magnetometer on ISTP/GEOTAIL. It consists of a triaxial fluxgate magnetometer mounted remote from the spacecraft on a boom, a multiple resolution A/D converter, and a microprocessor-controlled range control logic and data processing system. Seven measurement ranges are included: plus or minus 16, 64, 256, 1024, 4096, 16,384, and 65,536 nT. Resolution ranges from 0.004 to 16 nT in normal mode and 2.5E-4 to 1 nT in high resolution mode.

------- ISTP/WIND, GLOECKLER-------------------------------------

INVESTIGATION NAME- SOLAR WIND AND SUPRATHERMAL ION COMPOSITION STUDIES

NSSDC ID- WIND -08 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI	G.	GLOECKLER	U OF MARYLAND
CI	H.	BALSIGER	U OF BERNE
CI	J.	GEISS	U OF BERNE
CI	L.A.	FISK	U OF NEW HAMPSHIRE
CI	F.O.	GLIEM	BRAUNSCHWEIG TECH U
CI	T.E.	HOLZER	NATL CTR FOR ATMOS RES
CI	F.M.	IPAVICH	U OF MARYLAND
CI	K.W.	OGILVIE	NASA-GSFC
CI	W.	STUDEMANN	MPI-AERONOMY
CI	B.	WILKEN	MPI-AERONOMY

BRIEF DESCRIPTION

This investigation is designed (1) to provide detailed measurements of the elemental and ionic-charge composition of the solar wind, (2) to provide the average speed, density, and temperature of solar wind 4He++, and the average speed of solar wind protons, and (3) to provide the energy distributions of selected ion species. The instrument consists of three separate subsystems, the SWICS (solar wind ion composition), the STICS (suprathermal ion composition), and the DPU (data processing unit). The SWICS unit contains a time-of-flight sensor and a proton/alpha telescope. The STICS unit contains a time-of-flight sensor. The DPU contains two redundant microprocessors. The fields of view of the two sensor units are separated by 22.5 deg in the spacecraft spin plane. The energy range covered is 0.1 to 29 keV/Q.

------- ISTP/WIND, KAISER-------------------------------------

INVESTIGATION NAME- PLASMA AND RADIO WAVES

NSSDC ID- WIND -05 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS
RADIO PHYSICS

PERSONNEL

PI	M.L.	KAISER	NASA-GSFC
CI	J.	FAINBERG	NASA-GSFC
CI	R.G.	STONE	NASA-GSFC
CI	P.	RODRIGUEZ	US NAVAL RESEARCH LAB
CI	J.L.	STEINBERG	PARIS OBSERVATORY
CI	S.	HOANG	PARIS OBSERVATORY
CI	C.C.	HARVEY	PARIS OBSERVATORY
CI	P.J.	KELLOGG	U OF MINNESOTA
CI	E.J.	SMITH	NASA-JPL

CI	D.A.	GURNETT	U OF IOWA
CI	H.	MATSUMOTO	KYOTO U
CI	F.L.	SCARF	TRW SYSTEMS GROUP
CI	G.	DE GENOUILLAC	PARIS OBSERVATORY
CI	L.	CELNIKIER	PARIS OBSERVATORY

BRIEF DESCRIPTION

This investigation is designed to measure the intensity and arrival direction for both propagating and in situ waves originating in the solar wind near the earth. These waves depict the state of the solar wind impinging on the earth's magnetosphere. The instrument contains five subsystems within the main electronics box, plus the antenna subsystems which include a spin-axis and two spin-plane electric antennas (all spacecraft supplied) and a triaxial search coil (supplied by the plasma wave consortium). The five subsystems in the main electronics box are the radio frequency receivers, the comb filter receiver, the fast envelope sampler, the waveform analyzer, and the power distribution subsystem. The radio frequency receivers sweep over the band from about 1.5 kHz to 1 MHz. The comb filters have selectable bandwidths of 0.5, 1, or 2 Hz, with a total frequency range of 5 to 100 kHz. The fast envelope sampler is designed to capture transient events over four possible commandable decade ranges: 0.2-2, 0.6-6, 2-20, and 6-60 kHz. The waveform analyzer operates in the frequency regime below 16 kHz.

------- ISTP/WIND, LIN---

INVESTIGATION NAME- HOT PLASMA AND CHARGED PARTICLES

NSSDC ID- WIND -01

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI	R.P.	LIN	U OF CALIF, BERKELEY
CI	C.W.	CARLSON	U OF CALIF, BERKELEY
CI	K.A.	ANDERSON	U OF CALIF, BERKELEY
CI	M.K.	HUDSON	U OF CALIF, BERKELEY
CI	K.P.	WENZEL	ESA-ESTEC
CI	T.R.	SANDERSON	ESA-ESTEC
CI	R.	REINHARD	ESA-ESTEC
CI	G.	PASCHMANN	MPI-EXTRATERR PHYS
CI	N.	SCKOPKE	MPI-EXTRATERR PHYS
CI	G.K.	PARKS	U OF WASHINGTON
CI	B.H.	MAUK	U OF WASHINGTON
CI	H.	REME	CESR
CI	J.M.	BOSQUED	PAUL SABATIER U
CI	A.	ST. MARC	PAUL SABATIER U

BRIEF DESCRIPTION

This investigation, a three-dimensional plasma analyzer, is designed to meet the following objectives: (1) to make the first detailed exploration of the interplanetary particle population in the suprathermal energy range between solar wind plasma energies and 100 keV; (2) to study particle acceleration at the sun, in the interplanetary medium, and upstream from the earth; (3) to study the transport of particles in the interplanetary medium in the critical transition energy range between solar wind plasma and cosmic rays; and (4) to study the basic plasma processes occurring in the interplanetary medium, such as the production of radio emission by beam-plasma processes (Type III bursts) and shock waves (Type II), soliton collapse, and solar wind flux. The instrument measures the three-dimensional distribution of plasma and energetic electrons and ions with high energy, angular, and temporal resolution, over the energy range 10 eV to 5 MeV (different ranges for different parts of the instrument). The instrument consists of three detector systems, SST, EESA, and PESA. The SST consists of two arrays of semiconductor detectors (electron and proton), each consisting of six separate telescopes covering an aperture of 108 x 36 deg. EESA and PESA are quadrispherical analyzers (electron and proton, respectively), each mounted on a separate inertia boom. These analyzers, of novel design, provide significant measurements even at the lowest flux levels likely to be encountered by this spacecraft. The symmetrical quadrispherical electrostatic analyzers provide a large geometric factor, a uniform angular response at all polar angles, with about 1-deg angular resolution, and a 360-deg field of view. Microprocessors are employed to provide physically meaningful onboard data processing and compression, as well as flexibility of operation. For example, 10 moments of positive ion and electron distributions are computed every half spin period. In addition, the particles are sorted by pitch angle, using the magnetic field vector obtained directly from the magnetometer on board.

------- ISTP/WIND, OGILVIE---

INVESTIGATION NAME- SOLAR WIND PLASMA

NSSDC ID- WIND -06

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

ORIGINAL PAGE IS
OF POOR QUALITY

PERSONNEL

PI	K.W.	OGILVIE	NASA-GSFC
CI	L.F.	BURLAGA	NASA-GSFC
CI	J.D.	SCUDDER	NASA-GSFC
CI	E.C.	SITTLER, JR.	NASA-GSFC
CI	H.S.	BRIDGE	MASS INST OF TECH
CI	A.J.	LAZARUS	MASS INST OF TECH
CI	J.W.	BELCHER	MASS INST OF TECH
CI	G.L.	SISCOE	U OF CALIF, LA
CI	M.M.	NEUGEBAUER	NASA-JPL
CI	V.M.	VASYLIUNAS	MPI-AERONOMY

BRIEF DESCRIPTION

This investigation is designed to provide complete, accurate specification of solar wind flow parameters in real time. The instrument is a six-axis ion-electron spectrometer which provides three-dimensional velocity distribution functions for ions and electrons, with high time resolution. The energy range covered extends from 7 eV to 30 keV for electrons in four different modes, and from 30 eV to 30 keV in four different ion modes. In addition, two Faraday cups are used to obtain three-dimensional measurements of ions in 15-s periods, in the energy range 5 eV to 5 keV.

------- ISTP/WIND, TEEGARDEN---------------------------------------

INVESTIGATION NAME- GAMMA RAY BURSTS AND EUV SPECTROSCOPY

NSSDC ID- WIND -02

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
GAMMA-RAY ASTRONOMY

PERSONNEL

PI	B.J.	TEEGARDEN	NASA-GSFC
CI	T.L.	CLINE	NASA-GSFC
CI	R.	RAMATY	NASA-GSFC
CI	N.	GEHRELS	NASA-GSFC
CI	J.I.	TROMBKA	NASA-GSFC
CI	R.	PEHL	U OF CALIF, BERKELEY
CI	K.C.	HURLEY	CESR
CI	M.	NIEL	CESR
CI	G.	VEDRENNE	CESR

BRIEF DESCRIPTION

The objectives of this investigation are to provide the first high-resolution measurements of cosmic gamma-ray transients and solar flares. The germanium detector system covers the energy range 10 keV to 8 MeV in 8192 channels, with resolution of <2 keV FWHM at 1 MeV. The detector system is isotropic except for the 15% of the sky obscured by the spacecraft.

------- ISTP/WIND, VON ROSENVINGE-----------------------------------

INVESTIGATION NAME- COSMIC RAYS (EPACT); ENERGETIC PARTICLE ACCELERATION-COMPOSITION-TRANSPORT

NSSDC ID- WIND -07

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS
COSMIC RAYS

PERSONNEL

PI	T.T.	VON ROSENVINGE	NASA-GSFC
CI	M.A.	FORMAN	STATE U OF NEW YORK
CI	J.A.	LOCKWOOD	U OF NEW HAMPSHIRE
CI	W.R.	WEBBER	U OF NEW HAMPSHIRE
CI	G.E.	MORFILL	MPI-PHYS/ASTROPHYS
CI	R.	RAMATY	NASA-GSFC
CI	D.V.	REAMES	NASA-GSFC
CI	J.H.	TRAINOR	NASA-GSFC
CI	M.A.I.	VAN HOLLEBEKE	U OF MARYLAND
CI	T.T.	VON ROSENVINGE	NASA-GSFC

BRIEF DESCRIPTION

The EPACT (energetic particle acceleration-composition-transport) experiment is designed to provide a comprehensive study of energetic particle acceleration and transport processes in solar flares, in the interplanetary medium and in planetary magnetospheres as well as in galactic cosmic rays and the anomalous cosmic ray component. The instrument provides a complete description of electrons and atomic nuclei of different charge and isotopic composition over an energy range from 0.1 to 500 MeV/nucleon, and extending up to Z=92 (uranium). The instrument is divided into three semi-autonomous subsystems, the low energy angular distribution telescopes (LEAD), the low energy matrix telescopes (LEMT), and the electron/isotope telescope (ELITE). There are four individual LEAD sensors, two which view the hemisphere above the spin plane, and two pointed below the spin plane. There are also three LEMT sensors which are oriented above, below, and into the spin plane; and a single ELITE sensor which is double ended.

****************************** MOS-A ******************************

SPACECRAFT COMMON NAME- MOS-A
ALTERNATE NAMES- MARINE OBSERV. SAT. 1, MOS 1

NSSDC ID- MOS-A

LAUNCH DATE- 06/00/86 WEIGHT- 750. KG
LAUNCH SITE- TANEGASHIMA, JAPAN
LAUNCH VEHICLE- N-II

SPONSORING COUNTRY/AGENCY
JAPAN NASDA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 103. MIN INCLINATION- 99.1 DEG
PERIAPSIS- 909. KM ALT APOAPSIS- 909. KM ALT

PERSONNEL
PM - Y. ISHIZAWA NASDA
PS - NASDA STAFF NASDA

BRIEF DESCRIPTION
The Marine Observation Satellite (MOS-A) is Japan's first earth observation satellite. The three-axis stabilized spacecraft carries (1) a Multispectral Electronic Self-scanning Radiometer (MESSR) that collects data from both land and sea, (2) a Visible and Thermal Infrared Radiometer (VTIR) to measure sea surface temperature, (3) a Microwave Scanning Radiometer (MSR) to provide information on sea ice, snowfall, water vapor content at the ocean and in the atmosphere, and (4) a Data Collection System (DCS) transponder to collect observation data from drifting buoys. The spacecraft has a box-type shape with deployable solar panels. It is composed of two cubes, a bus module and a mission module, on which the three sensors are mounted. A sun-synchronous orbit is planned, with equatorial crossings in the descending node maintained between 10:00 a.m. and 11:00 a.m. local time. The mission life is designed to be 2 years.

------- MOS-A, EARTH OBS CTR-----------------------------------

INVESTIGATION NAME- MULTISPECTRAL ELECTRONIC SELF-SCANNING RADIOMETER (MESSR)

NSSDC ID- MOS-A -01 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
EARTH RESOURCES SURVEY
OCEANOGRAPHY

PERSONNEL
PI - EARTH OBS CTR NASDA
PI - INVESTIGATION GROUP JAPANESE GOVT AGENCIES

BRIEF DESCRIPTION
The Mutispectral Electronic Self-Scanning Radiometer (MESSR) experiment measures sea-surface color, the distribution of ice floes and chlorophyll, and the generation of red tides. It is also used to detect mineral and energy resources, crop inventories, and other on-land data. The push-broom scanning radiometer operates in four spectral bands: 0.51-0.59, 0.61-0.69, 0.72-0.80, and 0.80-1.10 micrometers. Incoming radiation is received by two optical systems. Each system is composed of a Gauss type telescope, a prism to divide the incident ray into two parts depending on wavelength, and two detectors of the charge-coupled device (CCD) type with 2048 elements. The instantaneous FOV is 54.7 microradians (approximately 50-m ground resolution) and the swath width is 100 km along track. For increased reliability of data, two sets of MESSRs are used; thus the swath width totals 200 km. Image data are converted by signal processors into digital format, and then are transmitted via 8000-MHz transmitters to the Earth Observation Center in Japan and to overseas ground stations.

------- MOS-A, EARTH OBS CTR-----------------------------------

INVESTIGATION NAME- VISIBLE AND THERMAL INFRARED RADIOMETER (VTIR)

NSSDC ID- MOS-A -02 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - EARTH OBS CTR NASDA
PI - INVESTIGATION GROUP JAPANESE GOVT AGENCIES

BRIEF DESCRIPTION
The Visible and Thermal Infrared Radiometer (VTIR) is a mechanical scanning type of radiometer that gathers information on clouds and sea-surface temperatures. Incoming radiation is collected by a reflecting mirror, which rotates with a rate of 7.3 rps and scans cross-track swaths 1500-km wide. The along track scan is provided by the motion of the spacecraft. The primary image produced at the image plane is spectrally separated by optical filters and relayed to detectors for photo-electric conversion. Si PIN diodes are selected for the visible band (0.5 to 0.7 micrometers), and Hg-Cd-Te elements are used for the three infrared bands (6.0 to 7.0, 10.5 to 11.5, and 11.5 to 12.5 micrometers). The instantaneous FOV of the sensors are 1 mrad for the visible region and 3 mrad for the infrared, which correspond to ground resolutions of 900 m and 2700 m, respectively. Image data in digital format are transmitted by an 8000-MHz link to the Earth Observation Center in Japan and to other foreign stations for processing.

------- MOS-A, EARTH OBS CTR-----------------------------------

INVESTIGATION NAME- MICROWAVE SCANNING RADIOMETER (MSR)

NSSDC ID- MOS-A -03 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - EARTH OBS CTR NASDA
PI - INVESTIGATION GROUP JAPANESE GOVT AGENCIES

BRIEF DESCRIPTION
The Microwave Scanning Radiometer (MSR) provides parameter measurement on sea ice, snowfall, and the water vapor content at the ocean surface and in the atmosphere. The system consists of an offset Cassegrain-type of antenna, a sky horn, two Dicke-type receivers, and detectors operating at 24 GHz and 31 GHz. The antenna scans in a conical, mechanical way with a period of 3.2 s. It oscillates 10 deg to either side of nadir with beam widths of less than 1.99 deg for the 24-GHz band and less than 1.45 deg for the 31-GHz band. The corresponding ground resolutions are approximately 32 km and 23 km, respectively; and the swath width is 317 km along track. Data from MSR, plus range and range rate signals, are transmitted at 2000 MHz directly to the Earth Observation Center in Japan and to other overseas earth observation stations for processing.

------- MOS-A, EARTH OBS CTR-----------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM TRANSPONDER (DCS TRANSPONDER)

NSSDC ID- MOS-A -04 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - EARTH OBS CTR NASDA
PI - INVESTIGATION GROUP JAPANESE GOVT AGENCIES

BRIEF DESCRIPTION
The experimental Data Collection System (DCS) Transponder is used to locate Data Collection Platform (DCPs) such as drifting buoys. Observational data from DCPs are transmitted at 400 MHz to a down-converter in the transponder, and the output signal is then transmitted with phase modulation by a 1700-MHz link to the Earth Observation Station in Japan.

****************************** MSL 1 ******************************

SPACECRAFT COMMON NAME- MSL 1
ALTERNATE NAMES- MSL-A, MATERIALS SCIENCE LAB-1

NSSDC ID- MSL-1

LAUNCH DATE- 10/00/85 WEIGHT- KG
LAUNCH SITE-
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 90.3 MIN INCLINATION- 28.5 DEG
PERIAPSIS- 296. KM ALT APOAPSIS- 296. KM ALT

PERSONNEL
MG - W.A. ORAN NASA HEADQUARTERS
SC - D.B. WRUBLIK NASA HEADQUARTERS

BRIEF DESCRIPTION
The Materials Science Laboratory payload, designated here as MSL-1, is a reflight of the materials experiment assembly (MEA) facility which flew on the OSTA-2 payload on the STS 7 Shuttle mission. Three Get Away Special (GAS) payload canisters from the NASA small self-contained payload program will also be part of the payload, which is located in the Shuttle cargo bay, on a mission-peculiar equipment support structure (MPESS). The MSL-1 objectives are to perform materials processing investigations in the low gravity Shuttle environment to produce data and samples for post-flight analysis by the investigators, to provide engineering verification of the Single Axis Acoustic Levitation (SAAL) furnace for conducting containerless processing in the low-gravity environment, and to provide carrier accommodations for three GAS payload canisters. Operation of the payload is autonomous once individual MEA or GAS experiments are activated by the crew from the Shuttle cabin. The MEA s self-contained,

and has thermal, electrical, data, and structural subsystems necessary to support the following facilities: a gradient-type general-purpose rocket furnace (G-GPRF), an isothermal-type general-purpose rocket furnace (I-GPRF), and the SAAL. The five materials investigations described below use the MEA facilities, and deal with directional solidification, vapor crystal growth, miscibility gap alloys, diffusion, and containerless glass technology.

------- MSL 1, CROUCH--

INVESTIGATION NAME- DIRECTIONAL SOLIDIFICATION OF COMPOUND SEMICONDUCTOR MATERIALS

NSSDC ID- MSL-1 -01 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL
PI - R.K. CROUCH NASA-LARC
PI - A.L. FRIPP NASA-LARC
OI - W.J. DELMAUR NASA-LARC

BRIEF DESCRIPTION
The scientific objective is to test the hypothesis that the suppression of convection in the space environment allows the production of lead-tin-telluride (Pb-Sn-Te) crystals with improved semiconductor characteristics. Pb-Sn-Te is an important semiconductor material which directly supports the development of infrared detectors and detector systems. This investigation utilizes the material processing technique of directional solidification of a compound semiconductor material to produce crystals. The specimen to be processed is placed in a sealed ampoule in one of the three thermally independent cavities of the gradient furnace. Following melting of the specimen and thermal equilibrium of the melt, a temperature gradient is established along the specimen length to allow the liquid-solid solidification front to move along the length of the specimen. Because of the absence of convective disturbances in zero-gravity environment, this procedure is expected to produce Pb-Sn-Te crystals that are superior in semiconductor characteristics to those derived from earth processes.

------- MSL 1, DAY--

INVESTIGATION NAME- CONTAINERLESS PROCESSING OF GLASS-FORMING MELTS

NSSDC ID- MSL-1 -02 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL
PI - D.E. DAY U OF MISSOURI

BRIEF DESCRIPTION
The primary investigation objective is to evaluate the operational capability of the Single Axis Acoustic Levitator (SAAL) to perform containerless materials-processing investigations. Science objectives include a determination of the raw materials preparation and melting procedures required to achieve chemically homogeneous viscous melts, and a comparative property analysis of glasses processed on earth and in space. The acoustic-powered levitator furnace will be used to process eight materials samples designed to evaluate the operational capability of the furnace, and to produce glass samples in zero gravity from various glass-forming compounds. The SAAL is controlled by an internal microprocessor which sequences a carousel mechanism containing the eight samples to provide injection into the furnace, containerless processing in the acoustic levitation field, and extraction of the processed sample. The high-temperature furnace cavity is heated by silicon carbide heating elements. Cooling is accomplished by positioning a metal cooling shroud around the sample. The sound beam is projected through a port in one wall of the furnace, and the specimen is injected through a port in the opposite wall. A quartz window allows primary data recording of melting and cooling behavior of the glass samples via a 16-mm motion picture camera. Upon activation during flight, the system is operated automatically by the preprogrammed levitator microprocessor control. Processed samples are analyzed postflight to determine their physical and optical characteristics.

------- MSL 1, GELLES--

INVESTIGATION NAME- LIQUID PHASE MISCIBILITY GAP MATERIALS

NSSDC ID- MSL-1 -03 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL
PI - S.H. GELLES S.H. GELLES ASSOCIATES

BRIEF DESCRIPTION
The overall scientific objective of the investigation is to understand how macro- and microstructures develop in liquid phase miscibility gap materials, with minimum interference from gravity-driven buoyancy forces and convection currents. Specific scientific objectives using this particular sample are to determine the effect on the phase separation process of surface-tension-driven convection currents arising at a free surface, and to determine whether indium-rich droplets present within the aluminum-rich host fluid migrate under the action of thermocapillary forces, while minimizing interference from the container walls by suitable selection of container materials. An immiscible (in earth gravity) alloy of aluminum and indium is placed in a sealed ampoule in one cavity of the isothermal furnace, melted in the zero gravity of space, and allowed to mix during a soak period by molecular diffusion. The mixed melt is solidified by lowering the furnace temperature below the monotectic temperature. The resultant processed specimen is analyzed postflight by the investigator to determine how the metallurgical characteristics of liquid phase miscibility gap materials develop in zero gravity. The effects of surface-tension convection and thermocapillary forces are also analyzed.

------- MSL 1, POND--

INVESTIGATION NAME- DIFFUSION OF MISCIBILITY GAP ALLOYS

NSSDC ID- MSL-1 -04 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL
PI - R. POND MARVALAUD, INC.

BRIEF DESCRIPTION
The scientific objective of this investigation is to measure the diffusion rate of two liquid metals that exhibit a solubility gap. Samples consisting of two metals, lead and zinc, which are insoluble on earth at solidification temperatures, due to greatly different densities, are placed in two cavities of the isothermal furnace, melted in zero gravity, and allowed to mix by molecular diffusion. The temperature of the melt is then rapidly lowered by a helium quench to effect a homogeneous solidification of the alloy. The resultant specimen is analyzed postflight by metallographic techniques to determine diffusion and material characteristics of the processed material. Time and temperature data and the processed material specimen will be available for postflight analysis.

------- MSL 1, WIEDEMEIER--

INVESTIGATION NAME- VAPOR GROWTH OF ALLOY-TYPE SEMICONDUCTOR CRYSTAL

NSSDC ID- MSL-1 -05 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL
PI - H. WIEDEMEIER RENSSELAER POLYTECHNIC

BRIEF DESCRIPTION
The investigation objectives include the continued study of zero gravity effects on vapor transport and crystal growth properties of the electronics material germanium selenide. Two cavities of the gradient furnace will contain the investigation materials. The chemical vapor transport technique is utilized to grow single crystals of germanium selenide. The specimens to be processed are placed in the furnace cavities in sealed ampoules, and a temperature gradient is used to induce the vapor transport from the source material at the hot end of the ampoule to the cooler end, where it crystallizes. Higher vapor mass transport rates are expected, causing the growth of larger crystals of higher perfection than can be produced on earth.

****************************** MSL 2******************************

SPACECRAFT COMMON NAME- MSL 2
ALTERNATE NAMES- MSL-B, MATERIALS SCIENCE LAB-2

NSSDC ID- MSL-2

LAUNCH DATE- 08/00/85 WEIGHT- KG
LAUNCH SITE-
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 90.3 MIN INCLINATION- 28.5 DEG
PERIAPSIS- 296. KM ALT APOAPSIS- 296. KM ALT

PERSONNEL
MG - W.A. ORAN NASA HEADQUARTERS
SC - D.B. WRUBLIK NASA HEADQUARTERS

BRIEF DESCRIPTION

The Material Science Laboratory (MSL) is a carrier system designed to utilize the residual space of the Shuttle cargo bay, and to offer a set of accommodations tailored for the user whose requirements are compatible with the standard mixed cargo allocation of Shuttle resources. The MSL-2 is based on the multi-purpose experiment support structure (MPESS) carrier, and offers a full complement of power, data, and thermal control services. The four investigations described below comprise the MSL-2 science payload. Each investigation uses one of the following three instruments: the electromagnetic levitator (EML), the 3-axis acoustic levitator (3AAL), or the automatic directional solidification furnace (ADSF). The EML is an apparatus capable of containerless melting and solidification of metals, alloys, and glasses having metal-like conductivities. The melting can be done to approximately 1400 deg C for specimens of 9-mm diam., and to lower peak temperature for smaller samples. The ADSF's high temperature system features include a 1600 deg C high thermal gradient translating furnace, programmable time delays for thermal soak and translation rate changes, four independent furnaces in temperature and translation rates, and a reference temperature capability for system test. The 3AAL contains the capability for video tape recording of samples in process, for spot heating of samples, and for maintaining the sample within an acoustic well through predicted gravitational bumps and STS accelerations.

------- MSL 2, FLEMING--

INVESTIGATION NAME- UNDERCOOLED SOLIDIFICATION IN QUIESCENT LEVITATED DROPS

NSSDC ID- MSL-2 -01 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - M.C. FLEMING MASS INST OF TECH

BRIEF DESCRIPTION

This investigation studies the undercooled solidification of samples in quiescent levitated drops. Six samples of glass-coated spheres of nickel-based tin alloys, two each at 25%, 33%, and 37% tin, are processed in the electromagnetic levitator. The specimens are deployed into the work coil and heated until melted. The electromagnetic force field is then set to an extremely low level, just sufficient to position a specimen within the coil. The subsequent cooling of the specimen as it undercools, recalesces, and then subsequently cools again is measured with a pyrometer. The specimen is photographed with a color motion picture camera during the later phases of heating and melting, and during subsequent cooling through recalescence, by its own incandescence. The specimens are subsequently recovered and subjected to detailed metallographic, X-ray, and electron beam analysis.

------- MSL 2, LARSON, JR.------------------------------------

INVESTIGATION NAME- ORBITAL PROCESSING OF ALIGNED MAGNETIC COMPOSITE

NSSDC ID- MSL-2 -02 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - D.J. LARSON, JR. GRUMMAN AEROSPACE CORP

BRIEF DESCRIPTION

This investigation studies the in-orbit processing of aligned magnetic composite material. The ADSF is used with a samarium/cobalt sample. The sample is raised to 1400 deg C. The temperature gradient to be used has not yet been determined.

------- MSL 2, SUBRUMANIAN------------------------------------

INVESTIGATION NAME- PHYSICAL PHENOMENA IN CONTAINERLESS GLASS PROCESSING-MODEL FLUIDS

NSSDC ID- MSL-2 -03 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - S. SUBRUMANIAN CLARKSON U

BRIEF DESCRIPTION

This investigation studies physical phenomena in containerless glass processing. Silicon oil and water are used in the 3-axis acoustic levitator. The investigation is performed at ambient temperature, with 15 sequences of 10 min each.

------- MSL 2, WANG--

INVESTIGATION NAME- DYNAMICS OF COMPOUND DROPS

NSSDC ID- MSL-2 -04 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - T.G. WANG NASA-JPL
OI - D.D. ELLEMAN NASA-JPL
OI - E.H. TRINH NASA-JPL

BRIEF DESCRIPTION

This investigation studies the dynamics of compound drops. Glycerine, silicon oil, and water are used in the 3-axis acoustic levitator. There are three operational sequences lasting about 20 min each, performed at ambient temperature.

*************************** MTSATP2 ***************************

SPACECRAFT COMMON NAME- MTSATP2
ALTERNATE NAMES- METEOSAT-P2

NSSDC ID- MTSATP2

LAUNCH DATE- 03/00/86 WEIGHT- 625. KG
LAUNCH SITE- KOUROU (CENTRE SPATIAL GUYANAIS), FRENCH GUIANA
LAUNCH VEHICLE- ARIANE-4

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 1436. MIN INCLINATION- 0.0 DEG
PERIAPSIS- 36000. KM ALT APOAPSIS- 36000. KM ALT

PERSONNEL
PM - J. AASTED ESA-TOULOUSE

BRIEF DESCRIPTION

Meteosat P2 is a refurbished protoype of Meteosat 2. In general, the spacecraft design, instrumentation, and operation are similar to SMS/GOES. The spin-stabilized, geostationary spacecraft carries (1) a visible-IR radiometer to provide high-quality day/night cloudcover data and to take radiance temperatures of the earth/atmosphere system, and (2) a meteorological data collection system to disseminate image data to user stations, to collect data from various earth-based platforms, and to relay data from polar-orbiting satellites. The cylindrically shaped spacecraft measures 210 cm in diameter and 430 cm in length, including the apogee boost motor. The primary structural members are an equipment platform and a central tube. The radiometer telescope is mounted on the equipment platform and views the earth through a special aperture in the side of the spacecraft. A support structure extends radially out from the central tube and is affixed to the solar panels, which form the outer walls of the spacecraft and provide the primary source of electrical power. Located in the annulus-shaped space between the central tube and the solar panels are stationkeeping and dynamics control equipment and batteries. Proper spacecraft attitude and spin rate (approximately 100 rpm) are maintained by jet thrusters mounted on the spacecraft and activated by ground command. The spacecraft uses both UHF-band and S-band frequencies in its telemetry and command systems. A lower power VHF transponder provides telemetry and command during launch and then serves as a backup for the primary subsystem once the spacecraft attains synchronous orbit.

------- MTSATP2, PERA--

INVESTIGATION NAME- DATA COLLECTION PLATFORM (DCP)

NSSDC ID- MTSATP2-02 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - L. PERA ESA-TOULOUSE

PERSONNEL
PI - M. MENDILLO BOSTON U

PERSONNEL
PI - H.K. SCHNOES U OF WISCONSIN

The data collection system is designed (1) to disseminate image data to user stations, (2) to collect data from various earth-based platforms, and (3) to provide for a space-to-space relay for data from polar-orbiting satellites. This experiment is similar to the meteorological data collection and transmission system (WEFAX) flown on SMS 1, SMS 2, and GOES series spacecraft. This experiment operates on S-band frequencies for WEFAX-type transmission and UHF for data collection platform report and interrogation.

------- MTSATP2, SERENE---

INVESTIGATION NAME- MULTISPECTRAL (VISIBLE AND INFRARED) IMAGING RADIOMETER

NSSDC ID- MTSATP2-01

INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - B. SERENE ESA-TOULOUSE

BRIEF DESCRIPTION

The Meteosat P2 visible-IR radiometer is capable of providing day/night observations of cloudcover and earth/cloud radiance temperature measurements from a synchronous, spin-stabilized satellite for use in operational weather analysis and forecasting. The five-channel instrument is able to take pictures of the full earth's disk. The three IR channels (two in the 10.5- to 12.5-micrometer region and one in the 5.7- to 7.1-micrometer region), and the two visible channels (0.4 to 1.1 micrometers) use a common optics system. Incoming radiation is received by a scan mirror and collected by an optical system. The scan mirror is set at a nominal angle of 45 deg to the radiometer optical axis, which is aligned parallel to the spin axis of the spacecraft. The spinning motion of the spacecraft (approximately 100 rpm) provides a west-to-east scan motion when the spin axis of the spacecraft is oriented parallel with the earth's axis. The latitudinal scan is accomplished by sequentially tilting the scanning mirror at the completion of each spin. Resolutions at the sub-satellite point are 2.5 km for the visible, and 5 km for the IR and water-vapor channels. Data from this experiment are to be available through the European Space Operations Center (ESOC), Darmstadt, W. Germany.

** NOAA-X **

SPACECRAFT COMMON NAME- NOAA-X
ALTERNATE NAMES- NOAA-D, NOAA-G
NOAA-H, NOAA-I
NOAA-J

NSSDC ID- NOAA-X

LAUNCH DATE- WEIGHT- 1030. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 101.5 MIN INCLINATION- 98.7 DEG
PERIAPSIS- 833. KM ALT APOAPSIS- 870. KM ALT

PERSONNEL
MG - J.R. GREAVES NASA HEADQUARTERS
PM - G.W. LONGANECKER NASA-GSFC
PS - J. SUSSKIND NASA-GSFC

BRIEF DESCRIPTION

NOAA-X is a collective name assigned by NSSDC to a series of third-generation operational meteorological spacecraft (NOAA-D, -H, -I, -J). Each satellite has an economical and stable sun-synchronous platform for advanced operational instruments to measure the earth's atmosphere, its surface and cloud cover, and the near-space environment. Primary sensors carried onboard include (1) an advanced very-high-resolution radiometer (AVHRR), (2) a TIROS operational vertical sounder (TOVS), (3) an earth radiation budget experiment (ERBE), and (4) a solar backscatter ultraviolet spectrometer (SBUV/2). Secondary experiments consist of a space environment monitor (SEM), and a data collection and platform location system (DCPLS). Except for NOAA-D, which is currently a back-up satellite in case a premature failure of an in-orbit spacecraft occurs, all NOAA-X satellites also carry a search and rescue satellite aided tracking (SARSAT) system. The satellites, which are based upon the Block 5D spacecraft bus developed for the U.S. Air Force, are capable of maintaining an earth-pointing accuracy of better than plus or minus 0.1 deg with a motion rate of less than 0.035 deg/s. Refer to Table 2, below, for projected launch dates and a list of specific sensors to be carried onboard each satellite.

INVESTIGATION NAME- EARTH RADIATION BUDGET EXPERIMENT (ERBE)

NSSDC ID- NOAA-X -05

INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
METEOROLOGY

PERSONNEL
TL - G.C. BROOME NASA-LARC
TM - A.A. RUDMANN NASA-GSFC

BRIEF DESCRIPTION

The Earth Radiation Budget Experiment (ERBE) is designed to measure the energy exchange between the earth-atmosphere system and space. The measurements of global, zonal, and regional radiation budgets on monthly time scales help in climate prediction and in the development of statistical relationships between regional weather and radiation budget anomalies. The ERBE consists of two instrument packages: the non-scanner (ERBE-NS) instrument and the scanner (ERBS-S) instrument. The ERBE-NS instrument has five sensors, each using cavity radiometer detectors. Four of them are primarily earth-viewing: two wide-FOV sensors view the entire disk of the earth from limb to limb, approximately 135 deg; two medium-FOV sensors view a 10-deg region. The fifth sensor is a solar monitor that measures total radiation from the sun. Of the four earth-viewing sensors, one wide- and one medium-FOV sensor make total radiation measurements; the other two measure reflected solar radiation in the shortwave spectral band between 0.2 and 5 micrometers by using Suprasil-W filters. The earth-emitted longwave radiation component is determined by subtracting the shortwave measurement from the total measurement. The ERBE-S instrument is a scanning radiometer which contains three narrow FOV channels. One channel measures reflected solar radiation in the shortwave spectral interval between 0.2 and 5 micrometers. Another channel measures earth-emitted radiation in the longwave spectral region from 5 to 50 micrometers. The third channel measures total radiation with wavelength between 0.2 and 50 micrometers. All three channels are located within a continuously rotating scan drum which scans the FOV across track sequentially from horizon to horizon. Each channel makes 74 radiometric measurements during each scan, and the FOV of each channel is 3 by 4.5 deg, which covers about 40 km at the earth's surface. The ERBE-S also views the sun for calibration. Additional information can be obtained from "Earth Radiation Budget Experiment (ERBE): An Overview", J. Energy, v. 6, pp. 141-146 (1982), by B. R. Barkstrom and J. B. Hall, Jr.

------- NOAA-X, CUNNINGHAM---

INVESTIGATION NAME- SOLAR BACKSCATTER ULTRAVIOLET RADIOMETER (SBUV/2)

NSSDC ID- NOAA-X -07

INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
UPPER ATMOSPHERE RESEARCH

PERSONNEL
TL - F.G. CUNNINGHAM NASA-GSFC
TM - D.F. HEATH NASA-GSFC

BRIEF DESCRIPTION

The Solar Backscatter Ultraviolet Radiometer (SBUV/2) is designed to provide the vertical distribution of ozone in the earth's atmosphere. The instrument design is based upon the technology developed for the SBUV/TOMS flown on the Nimbus 7. The SBUV/2 instrument measures backscattered solar radiation in an 11.3-deg field-of-view in the nadir direction at 12 discrete, 1.1-nm wide, wavelength bands between 252.0 and 339.8 nm. The solar irradiance is determined at the same 12 wavelength bands by deploying a diffuser which reflects sunlight into the instrument field-of-view. The SBUV/2 can also measure the solar irradiance or the atmospheric radiance with a continuous spectral scan from 160 nm to 400 nm in increments nominally 0.148 nm. The SBUV/2 has another narrowband filter photometer channel, called the cloud cover radiometer (CCR), which continuously measures the earth's surface brightness at 380 nm. The CCR field-of-view is 11.3 deg.

------- NOAA-X, LEINBACH---

INVESTIGATION NAME- SPACE ENVIRONMENTAL MONITOR (SEM)

NSSDC ID- NOAA-X -04

INVESTIGATIVE PROGRAM
CODE EE/OPER. ENVIRON. MONITORIN

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

ORIGINAL PAGE IS
OF POOR QUALITY

PERSONNEL
PI - A.P. WILLMORE U OF BIRMINGHAM
OI - C.J. EYLES U OF BIRMINGHAM

PERSONNEL
PI - S. BISWAS TATA INST OF FUND RES
CI - J.N. GOSWAMI PHYSICAL RESEARCH LAB

PI - D.S. EVANS NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION

The Space Environmental Monitor (SEM) experiment is an extension of the solar-proton monitoring experiment flown on the ITOS spacecraft series. The objective is to measure proton flux, electron flux density, and energy spectrum in the upper atmosphere. The experiment package consists of two detector systems and a data processing unit. The medium energy proton and electron detector (MEPED) measures protons in five energy ranges from 30 keV to >2.5 MeV; electrons above 30, 100, and 300 keV; protons and electrons (inseparable) above 6 MeV; and omni-directional protons above 16, 36, and 80 MeV. The total energy detector (TED) measures the intensity of protons and electrons between 300 eV and 20 keV.

------- NOAA-X, NESDIS STAFF-----------------------------------

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- NOAA-X -01 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION

The NOAA-X Advanced Very High Resolution Radiometer (AVHRR) is a four- or five-channel scanning radiometer capable of providing global daytime and nighttime sea surface temperature and information about ice, snow, and clouds. These data are obtained on a daily basis for use in weather analysis and forecasting. The multispectral radiometer operates in the scanning mode and measures emitted and reflected radiation in the following spectral intervals: channel 1 (visible), 0.55 to 0.9 micrometer; channel 2 (near-IR), 0.725 micrometer to detector cutoff around 1.1 micrometers; channel 3 (IR window), 10.5 to 11.5 micrometers; channel 4 (IR window), 3.55 to 3.93 micrometers; and channel 5, 11.5 to 12.5 micrometers, which is the only channel that does not exist in the instrument on board NOAA-D. All five channels have a spatial resolution of 1.1 km, and the two IR-window channels have a thermal resolution of 0.12 deg K at 300 deg K. The AVHRR is capable of operating in both real-time or recorded modes. Real-time or direct readout data are transmitted to ground stations both at low (4-km) resolution via automatic picture transmission (APT) and at high (1-km) resolution via high-resolution picture transmission (HRPT). Data recorded on board are available for processing in the NOAA central computer facility. They include global area coverage (GAC) data, which have a resolution of 4 km, and local area coverage (LAC) data, which contain data from selected portions of each orbit with a 1-km resolution.

------- NOAA-X, NESDIS STAFF-----------------------------------

INVESTIGATION NAME- TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)

NSSDC ID- NOAA-X -02 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION

The TIROS Operational Vertical Sounder (TOVS) on NOAA-X consists of three instruments: the high-resolution infrared radiation sounder modification 2 (HIRS/2), the stratospheric sounding unit (SSU), and the microwave sounding unit (MSU). All three instruments are designed to determine radiances needed to calculate temperature and humidity profiles of the atmosphere from the surface to the stratosphere (approximately 1 mb). The HIRS/2 instrument has 20 channels in the following spectral intervals: channels 1 through 5, the 15-micrometer CO2 bands (15.0, 14.7, 14.5, 14.2, and 14.0 micrometers); channels 6 and 7, the 13.7- and 13.4-micrometer CO2/H2O bands; channel 8, the 11.1-micrometer window region; channel 9, the 9.7-micrometer ozone band; channels 10 through 12, the 6-micrometer water vapor bands (12.55, 7.3, and 6.7 micrometers); channels 13 and 14, the 4.57- and 4.52-micrometer N2O bands; channels 15 and 16, the 4.46- and 4.40-micrometer CO2/N2O bands; channels 17, 18 and 19, the 4.25-, 4.0- and 3.7-micrometer window bands; and channel 20, the 0.7-micrometer visible region. For NOAA-I and -J, channels 10 and 17 operate at 12.25 and 4.13 micrometers, respectively. Resolution for all channels is 17.4 km at nadir. The HIRS/2 instrument provides data for calculations of temperature profiles from the surface to 10 mb, water vapor content at three levels of the atmosphere, and total ozone content. The second instrument, the SSU, is provided by United Kingdom. It has three channels that operate at 15.0 micrometers with three pressure-modulated cells containing CO2 to accomplish selective bandpass filtration of the sampled radiance. The third instrument, the MSU, has four channels operating in the 50- to 60-GHz oxygen

------- NOAA-X, NESDIS STAFF-----------------------------------

INVESTIGATION NAME- DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCLS)

NSSDC ID- NOAA-X -03 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION

The Data Collection and Platform Location System (DCPLS) on NOAA-X, also known as ARGOS, is designed and built in France to meet the meteorological data needs of the United States. The system receives low-duty-cycle transmissions of meteorological observations from free-floating balloons, ocean buoys, other satellites, and fixed ground-based sensor platforms distributed around the globe. These observations are organized on board the spacecraft and retransmitted when the spacecraft comes within range of a command and data acquisition (CDA) station. For free-moving balloons, the Doppler frequency shift of the transmitted signal is observed to calculate the location of the balloons. The DCLS is expected, for a moving sensor platform, to have a location accuracy of 5 to 8 km rms, and a velocity accuracy of 1 to 1.6 m/s. This system has the capability of acquiring data from up to 2000 platforms per day. Processing and dissemination of data are handled by CNES in Toulouse, France.

------- NOAA-X, NESDIS STAFF-----------------------------------

INVESTIGATION NAME- SEARCH AND RESCUE SATELLITE AIDED TRACKING (SARSAT)

NSSDC ID- NOAA-X -06 INVESTIGATIVE PROGRAM
CODE EE/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS

PERSONNEL
PI - NESDIS STAFF NOAA-NESDIS

BRIEF DESCRIPTION

The Search and Rescue Satellite Aided Tracking (SARSAT) instruments, provided by Canada and France, have the capability of detecting and locating existing emergency transmitters in a manner independent of the environmental data. Data from the 121.5-MHz emergency locator transmitters (ELT), the 243-MHz emergency position indicating radio beacons (EPIRB), and experimental 406-MHz ELTs/EPIRBs are received by the search and rescue repeater (SARR) and broadcast in real time on an L-band frequency (1544.5 MHz). Real-time data are monitored by local user terminals operated in the United States, Canada, and France. The 406-MHz data are also processed by a search and rescue processor (SARP), and stored on the spacecraft for later transmittal to the CDA stations in Alaska and Virginia, thus providing full global coverage. The distress signals are forwarded to Mission Control Centers located in each country for subsequent relay to the appropriate Rescue Coordination Center.

*************************** PLANET-A ***************************

SPACECRAFT COMMON NAME- PLANET-A
ALTERNATE NAMES-

NSSDC ID- PLANETA

LAUNCH DATE- 08/14/85 WEIGHT- 138. KG
LAUNCH SITE- KAGOSHIMA SPACE CENTER, JAPAN
LAUNCH VEHICLE- M-3SII-2

SPONSORING COUNTRY/AGENCY
JAPAN ISAS

PLANNED ORBIT PARAMETERS
ORBIT TYPE- COMET RENDEZVOUS

PERSONNEL
PM - K. HIRAO ISAS
PS - M. SHIMIZU ISAS

BRIEF DESCRIPTION

Planet-A is planned to fly by the nucleus of Comet Halley on March 8, 1986, at a distance of several hundred thousand kilometers. The main objective of the mission is to take UV images of the hydrogen corona for about 30 days before and after Comet Halley's descending crossing of the ecliptic plane. Solar wind parameters are measured for a much longer time period. The spacecraft weighs about 1[illegible] kg and is spin-stabilized at two different rates (5 and [illegible].2 rpm) during the mission. Hydrazine thrusters are used for attitude and velocity control; star and sun sensors are for attitude control; and a mechanically despun off-set parabolic dish is used for long range communication. A test spacecraft,

------- SPACELAB 3, COURTES-----------------------------------

INVESTIGATION NAME- VERY WIDE FIELD CAMERA

BRIEF DESCRIPTION

The primary purpose of the Atmospheric Trace Molecules Observed by Spectroscopy (ATMOS) experiment is to demonstrate

Table 2

NOAA-X Series Missions

The following table includes information about the planned launch dates and experiments for spacecraft in the NOAA-X series. This series is described in a generic manner on pages 163 to 164. When each of these spacecraft is launched, the last letter in its name will be changed to a numeral.

Spacecraft Series Letter	D	G	H	I	J
*Launch Dates - Schedule A Schedule B	8/86 3/87	6/85 9/85	12/86 9/88	12/87 3/90	12/88
EXPERIMENTS					
Advanced Very High Resolution Radiometer (AVHRR)	X	X	X	X	X
Data Collection and Platform Location System (DCLS)	X	X	X	X	X
Earth Radiation Budget Experiment (ERBE)		X			
Search and Rescue Satellite Aided Tracking (SARSAT)		X	X	X	X
Solar Back Scatter Ultraviolet Radiometer-2 (SBUV/2)		X	X	X	X
Space Environmental Monitor (SEM)	X	X		X	
**TIROS Operational Vertical Sounder (TOVS)	X	X	X	X	X

*Schedule A -- two-satellite system
Schedule B -- one-satellite system

**A subsystem called SSU is not flying on every satellite.

the fluid.

NSSDC ID- SPALAB3-09

INVESTIGATIVE PROGRAM
CODE RS

------- SPACELAB 3, LAL---------------------------------------

INVESTIGATION NAME- SOLUTION GROWTH OF CRYSTALS
IN ZERO GRAVITY

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

Sakigake, launched earlier, will provide some measurements at the same time but at distances of several million kilometers.

------- PLANET-A, KANEDA---------------------------------------

INVESTIGATION NAME- UV IMAGING TELESCOPIC CAMERA

NSSDC ID- PLANETA-01 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY

PERSONNEL
PI - E. KANEDA U OF TOKYO

BRIEF DESCRIPTION
This instrument is used to take UV images of the hydrogen corona of the comet at the hydrogen Lyman-alpha line. It is composed of a mirror telescope, a UV intensifier, and a spin-synchronized camera that uses charge-coupled devices (CCD). During imaging, the spacecraft will be despun to 0.2 rpm.

------- PLANET-A, MUKAI---------------------------------------

INVESTIGATION NAME- ION ELECTRON ESAS

NSSDC ID- PLANETA-02 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
INTERPLANETARY PHYSICS

PERSONNEL
PI - T. MUKAI ISAS

BRIEF DESCRIPTION
Solar wind plasma measurements are made with 270-deg electrostatic analyzers (ESP) in this investigation. Both ions and electrons in the energy range between 0.03 and 16 keV are measured with the ESP employing micro-channel plates. Three-dimensional distribution of the solar wind plasma within plus or minus 30 deg of the ecliptic plane will be measured.

*************************** POLAR BEAR ***************************

SPACECRAFT COMMON NAME- POLAR BEAR
ALTERNATE NAMES- STP P87-A, BEACON EXP&AURORAL RESCH

NSSDC ID- PLRBEAR

LAUNCH DATE- 10/00/86 WEIGHT- KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- SCOUT

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- MIN INCLINATION- 90. DEG
PERIAPSIS- 1000. KM ALT APOAPSIS- 1000. KM ALT

PERSONNEL
PM - D. CASE USAF SPACE DIVISION

BRIEF DESCRIPTION
The Polar BEAR S/C (also known as STP P87-A) is a modified TRANSIT S/C which carries experiments intended to provide remote-sensing and in situ measurements of physical quantities likely to provide insight into the dynamics of plasma-density irregularity formation in the high-latitude ionosphere. BEAR is an acronym for Beacon Experiment and Auroral Research.

------- POLAR BEAR, FREMOUW---------------------------------------

INVESTIGATION NAME- MULTI-FREQUENCY COHERENT RADIO BEACON

NSSDC ID- PLRBEAR-01 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL
PI - E.J. FREMOUW PHYSICAL DYNAMICS, INC

BRIEF DESCRIPTION
This experiment is a three-frequency phase-locked coherent radio beacon that is designed to be used by ground stations to record the phase and intensity of ionospheric scintillations and the total electron content between the beacon and the receiver. The experiment can transmit on three frequencies: UHF, VHF, and L-band. The L-band is also used to transmit the data from the auroral/ionospheric remote sensor.

------- POLAR BEAR, HUFFMAN---------------------------------------

INVESTIGATION NAME- AURORAL/IONOSPHERIC REMOTE SENSOR

NSSDC ID- PLRBEAR-02 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
IONOSPHERES

PERSONNEL
PI - R.E. HUFFMAN USAF GEOPHYS LAB
PI - C.I. MENG APPLIED PHYSICS LAB

BRIEF DESCRIPTION
The Auroral/Ionospheric Remote Sensor (AIRS) is intended to give simultaneous synoptic information through optical remote sensing of the ionosphere. The instrument consists primarily of a two-channel vacuum-ultraviolet (VUV) imaging spectrometer which can operate in any of three modes. The full-imaging mode provides auroral/ionospheric images in any two of six selectable wavelengths in the range 1100 A to 1900 A, each with a bandwidth of 30 A. Cross-track line scans with 336 pixels per line can yield nadir resolution of 5 by 20 km at auroral altitude. The other two modes are fixed nadir-viewing ones. One of these modes is a spectrophotometer mode in which a 30-A filter can be swept from 1100 A to 1900 A. The other mode is a simple fixed-wavelength photometer mode. In addition to the VUV imaging spectrometer, AIRS contains two nadir-viewing visual-wavelength photometers. One operates at 3914 A and the other operates at 6300 A.

*************************** ROSAT ***************************

SPACECRAFT COMMON NAME- ROSAT
ALTERNATE NAMES- ROENTGENSATELLITE, GERMAN X-RAY SATELLITE

NSSDC ID- ROSAT

LAUNCH DATE- 09/00/87 WEIGHT- KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
FED REP OF GERMANY DFVLR
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 94. MIN INCLINATION- 57. DEG
PERIAPSIS- 475. KM ALT APOAPSIS- 475. KM ALT

PERSONNEL
MG - M.B. WEINREB NASA HEADQUARTERS
MG - M. OTTERBEIN BMFT
SC - A.G. OPP NASA HEADQUARTERS
PM - G.W. OUSLEY NASA-GSFC
PM - K. PFEIFFER DFVLR
PS - S.S. HOLT NASA-GSFC
PS - J. TRUEMPER MPI-EXTRATERR PHYS

BRIEF DESCRIPTION
The Roentgensatellite (ROSAT) is a US/German cooperative project with British participation. The prime objective, during the first 6 months of the mission, is to perform a complete sky survey in the energy range 0.041 to 2 keV utilizing proportional counters at the focal plane of a large X-ray telescope (LXT) provided by Germany and an XUV wide field camera (WFC) provided by the UK. After completion of the all sky survey the second scientific objective (during the following 12 months) will be the detailed observation of selected sources with respect to spatial structure, spectra, and time variability. This objective will be met by utilizing a high resolution imager (HRI), provided by the United States, which will alternate with the two position-sensitive proportional counters (PSPC) in the focal plane. ROSAT is a continuously operating three-axis-stabilized S/C. The main telescope has a focal length of 240 cm, a diameter of 113 cm, and is surrounded by S/C electronics. The axis lies between two large solar panels and parallel to the WFC axis. The telescope resolution with the HRI is better than 10 arc-s. ROSAT has an attitude control system using two advanced star trackers, reaction wheels, and magnetic coils, and a data system utilizing two tape recorders.

------- ROSAT, GERDES---------------------------------------

INVESTIGATION NAME- HIGH RESOLUTION IMAGER (HRI)

NSSDC ID- ROSAT -01 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL
EM - J. GERDES SAO
FS - S.S. HOLT NASA-GSFC

BRIEF DESCRIPTION

The high resolution imager (HRI) is essentially a copy of the very successful HRI provided by SAO for the HEAO 2 mission, modified to comply with the electrical and mechanical interfaces of ROSAT. Incoming X-ray photons are converted to electrons at a photocathode. The electrons are multiplied in a pair of cascaded microchannel plates (MCP) with a gain of about 1E8. A crossed grid at the exit of the MCP collects the electron cloud, thereby yielding a measurement of the location of the incoming photon with an positional accuracy of about 25 micrometers. A radioactive calibration source is attached to the retractable vacuum door in front of the HRI. For inflight calibration, a UV source is integrated into the HRI.

------- ROSAT, TRUEMPER--------------------------------------

INVESTIGATION NAME- POSITION SENSITIVE PROPORTIONAL COUNTER (PSPC)

NSSDC ID- ROSAT -02 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL
PI - J. TRUEMPER MPI-EXTRATERR PHYS
OI - H. HIPPMANN MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

The position sensitive proportional counter (PSPC) is a thin window gas counter. Incoming photons are absorbed, producing an electron cloud proportional to the photon energy. The electron cloud drifts to the anode wire grid where a high voltage is applied. In the high electric field, close to the wires, gas amplification of about 5E4 takes place producing a charge signal at the anode wires which is proportional to the energy of the incoming photons. Simultaneous charge signals are induced in two cathode wire grids close to the anode. These signals are used to obtain the position of the photons with an accuracy of about 120 micrometers. A rotating filter wheel, in front of each PSPC, allows the selection of reduced photon energy bands. In one position, the filter wheel is utilized as a vacuum door containing three radioactive sources for calibration.

------- ROSAT, WELLS---

INVESTIGATION NAME- WIDE FIELD CAMERA

NSSDC ID- ROSAT -03 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL
PI - A. WELLS U OF LEICESTER
OI - G.M. COURTIER RUTHERFORD APPLETON L.

BRIEF DESCRIPTION

The wide field camera (WFC) consists of three nested aluminum mirrors with an XUV sensitized microchannel plate (MCP) detector at the focus. A focal turret assembly is used to select one of two identical detector assemblies. The clear field of view is a 4-deg half-angle cone around the WFC axis. The energy range of the WFC is 0.21 to 0.041 keV.

*************************** SAN MARCO-D/L*********************

SPACECRAFT COMMON NAME- SAN MARCO-D/L
ALTERNATE NAMES-

NSSDC ID- SM-DL

LAUNCH DATE- 04/00/85 WEIGHT- 230. KG
LAUNCH SITE- SAN MARCO PLATFORM, OFF COAST OF KENYA
LAUNCH VEHICLE- SCOUT

SPONSORING COUNTRY/AGENCY
ITALY CRA
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 100. MIN INCLINATION- 2.9 DEG
PERIAPSIS- 260. KM ALT APOAPSIS- 800. KM ALT

PERSONNEL
MG - M.B. WEINREB NASA HEADQUARTERS
SC - E.R. SCHMERLING NASA HEADQUARTERS
PM - R.E. ADKINS NASA-GSFC
PS - N.W. SPENCER NASA-GSFC

BRIEF DESCRIPTION

The primary purpose of the San Marco - D/L Spacecraft is to explore the relationship between solar activity and thermosphere-ionosphere phenomena. The S/C, to be launched by a Scout vehicle, has a planned lifetime of 1.0 year. The science investigations use the following five flight sensors: a drag balance for determining neutral density, a wind and temperature spectrometer, an ion velocity instrument, an airglow-solar spectrometer, and an electric field meter. The satellite is a 96.5-cm-diameter sphere with four 48-cm canted monopole telemetry antennas and three orthogonal pairs of electric field probe sensors (one pair oriented along the spacecraft spin axis). An internal structural cylinder (26-cm diam) extends slightly through the sphere and is coincident with the satellite spin axis. The power supply consists of a solar-cell array split into two sections, two rechargeable nickel-cadmium batteries, and associated circuitry. The satellite attitude data are provided by a triaxial magnetometer, a horizon sensor, a digital sun sensor, and a star tracker for calibration. A magnetic torquing system is used to control spin rate and spacecraft attitude. A tape recorder records the PCM telemetry at 6000 bps for a maximum period of 50 min. The transmission to the ground is either in real time at 6000 bps or on recorder playback at 72 kbps.

------- SAN MARCO-D/L, BROGLIO--------------------------------

INVESTIGATION NAME- DRAG BALANCE AND AIR DENSITY

NSSDC ID- SM-DL -01 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL
PI - L. BROGLIO NATL RES COUNC ITALY

BRIEF DESCRIPTION

The drag balance instrument, which is an integral part of the satellite, consists of an inner mass, an elastic element, and an outer shell. The drag balance is the connecting elastic element between the outer light shell and the inner heavy body. The center of the balance is located at the satellite's geometric center, or that point which is the geometric center both of the inner body and the shell. This instrument measures the relative translations between the shell and the inner body both in value and direction, resolving any relative translation along three mutually orthogonal axes. These three axes are fixed to the body, one of them being coincident with the polar symmetry axis of the satellite. Being fixed to the satellite, the axis rotates with it in the free-precession motion around the center of gravity. The balance is designed in such a way that the maximum translation between the shell and the drum is generally of the order of 0.01 mm. In most cases the drag force at the apogee is negligible, and therefore the apogee data are used to get an inflight calibration of the balance. The translation of the elastic system is changed into voltages that are amplified and demodulated to obtain dc signals.

------- SAN MARCO-D/L, HANSON--------------------------------

INVESTIGATION NAME- ION VELOCITY INSTRUMENT (IVI) PLANAR RETARDING POTENTIAL ANALYZER

NSSDC ID- SM-DL -03 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL
PI - W.B. HANSON U OF TEXAS, DALLAS

BRIEF DESCRIPTION

This investigation uses a planar retarding potential analyzer, designed to obtain measurements of relative thermal-ion velocity, plasma density, and ion temperature. The ion angle of arrival can be determined by use of a square aperture collimator and a split collector. Together with knowledge of spacecraft motion, this allows computation of the three-dimensional thermal-ion motion along the orbital path. Plasma density and temperature are calculated by interpretation of the volt-ampere profile produced by the instrument for a given impressed voltage pattern on the grids and collector. Ion velocity measurements are obtained once each spacecraft spin period (10 s).

------- SAN MARCO-D/L, MAYNARD-------------------------------

INVESTIGATION NAME- 3-AXIS ELECTRIC FIELD INSTRUMENT (EFI)

NSSDC ID- SM-DL -05 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL
PI - N.C. MAYNARD USAF GEOPHYS LAB
OI - J.P. HEPPNER NASA-GSFC

BRIEF DESCRIPTION

This experiment is designed to observe the three components of ambient electric field over the satellite trajectory. Three pairs of cylindrical probes are used, a pair for each component. For each component, the floating potential of each of the two symmetrically spaced probes with respect to the spacecraft is measured. From these observations, the electric field can be calculated for known conditions of satellite motion, probe geometry, and magnetic field. Two

pairs of probes extend from the satellite equator, and one pair is oriented along the spin axis.

------- SAN MARCO-D/L, SCHMIDTKE-------------------------------

INVESTIGATION NAME- AIRGLOW-SOLAR SPECTROMETER

NSSDC ID- SM-DL -02   INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
AERONOMY
ATMOSPHERIC PHYSICS

PERSONNEL

PI - G.	SCHMIDTKE	INST FUR PHYS WELTRAUM
OI - F.	FISCHER	INST FUR PHYS WELTRAUM
OI - M.	KNOTHE	INST FUR PHYS WELTRAUM
OI - M.	MASCHEK	INST FUR PHYS WELTRAUM
OI - C.	MUNTHER	INST FUR PHYS WELTRAUM

BRIEF DESCRIPTION
This sensor measures the equatorial day and night airglow, the solar radiation reflected from the earth's surface and from clouds, and the radiation of interplanetary and intergalactic origin reaching the satellite in the spectral range from 20 to 700 nm with a spectral resolution of 0.7 to 4 nm. Four spectrometers, four gratings, and 17 multipliers are used. A toroidal concave grating, of radius equal to 115.5 mm, with holographically formed curved lines, was selected to achieve wavelength scanning. The scanning is performed by stepwise rotation of the grating within plus or minus 3 deg. Exit slits are positioned at optimum distances near the Rowland circle. The exit slits are followed by multipliers. A filter wheel provides three filters for each multiplier working above 130 nm.

------- SAN MARCO-D/L, SPENCER-------------------------------

INVESTIGATION NAME- WIND AND TEMPERATURE SPECTROMETER (WATS)

NSSDC ID- SM-DL -04   INVESTIGATIVE PROGRAM
CODE EE/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
PLANETARY ATMOSPHERES
ATMOSPHERIC PHYSICS

PERSONNEL

PI - N.W.	SPENCER	NASA-GSFC
OI - G.R.	CARIGNAN	U OF MICHIGAN
OI - J.C.	MAURER	U OF MICHIGAN
OI - L.E.	WHARTON	NASA-GSFC

BRIEF DESCRIPTION
The objective of this investigation is to measure the in situ neutral winds, neutral particle temperatures, and the concentration of selected gases. Three components of the winds are measured. Two scanning baffles are used, one moving vertically in front of the sensor and one moving horizontally, nearly identical in concept to the scanning baffles incorporated on the WATS for DE-2. The magnitudes of the horizontal and vertical components of the wind normal to the spacecraft velocity vector are computed from measurements of the angular relationship between the neutral particle stream and the sensor. The component of the total stream velocity in the satellite direction is measured directly by the retarding potential quadrupole (RPQ), through determination of the required retarding potential. From these quantitative measurements, the wind vector is computed. The temperature technique used on the DE WATS provides the basis for the temperature measurements for this mission. The wind and temperature measurement can be performed nearly simultaneously. For composition measurements, the RPQ mass spectrometer is used in a separate operating mode designed for that purpose.

*************************** SAX ***************************

SPACECRAFT COMMON NAME- SAX
ALTERNATE NAMES- SAT. FOR X-RAY ASTRONOMY

NSSDC ID- SAX

LAUNCH DATE- 00/00/88   WEIGHT- 900. KG
LAUNCH SITE-
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
ITALY   SAX

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 94.6 MIN   INCLINATION- 12. DEG
PERIAPSIS- 500. KM ALT   APOAPSIS- 500. KM ALT

PERSONNEL
PM - UNKNOWN

BRIEF DESCRIPTION
SAX is the X-Ray Astronomy Satellite selected by the Italian National Space Plan for inclusion in the Science Plan. The objective of the mission is to perform spectroscopic and time variability studies of celestial X-ray sources in the energy band from 1 to 200 keV, including an all-sky monitoring investigation of transients in the 2-30 keV energy range. The payload includes the following narrow-field detectors coaligned to a common pointing axis: (1) four X-ray imaging concentrators sensitive from 1 to 10 keV (one of them extending down to 0.1 keV), (2) one gas scintillation proportional counter sensitive from 3 to 12 keV, and (3) a sodium iodide scintillator crystal in phoswich configuration operating from 15 to 200 keV. At 90 deg to the axis of the narrow field instruments is an array of three identical wide field camera units sensitive from 2 to 30 keV. The SAX mission payload and science program is under the responsibility of a consortium of Italian institutes together with institutes from Holland. The participation of the Space Science Department of ESA is also foreseen. A listing of the SAX Consortium of Institutes is given in Appendix B8.

------- SAX, UNKNOWN-------------------------------

INVESTIGATION NAME- NARROW FIELD X-RAY IMAGING CONCENTRATORS

NSSDC ID- SAX -01   INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY
HIGH ENERGY ASTROPHYSICS

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
Four imaging concentrators are provided. Three concentrators operate in the energy range from 1 to 10 keV while the fourth operates in the energy range from 0.1 to 10 keV. Each concentrator has a geometrical area of 90 sq cm, a focal length of 165 cm, a circular field of view of 30 arc-min, and an angular resolution of the order of 1 arc-min. The energy resolution is ?% at 6 keV. The overall sensitivity, at the 5-sigma level, of the system in the 1-10 keV energy range is 1E(-5) photon/(sq cm-s-keV) per orbit. The sensitivity, at the 5-sigma level, to emission lines at 6.7 keV is 1.5E(-5) photon/(sq cm-s) in 1E4 s.

------- SAX, UNKNOWN-------------------------------

INVESTIGATION NAME- NARROW FIELD GAS SCINTILLATION PROPORTIONAL COUNTER (PHOSWICH)

NSSDC ID- SAX -02   INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY
HIGH ENERGY ASTROPHYSICS

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
The gas scintillation proportional counter (GSPC) operates over the energy range of 3 to 120 keV. Other characteristics of the GSPC include a geometrical area of 450 sq cm, an energy resolution of 10% at 6 keV and 3% at 60 keV, a field of view of 1 deg by 1 deg, a sensitivity at 10 keV of 2.1E(-4) photon/(sq cm-s-keV) per orbit, and a sensitivity for narrow lines at 60 keV of 3E(-4) photon/(sq cm-s) in 1E4 s.

------- SAX, UNKNOWN-------------------------------

INVESTIGATION NAME- NARROW FIELD SODIUM IODIDE SCINTILLATION DETECTOR

NSSDC ID- SAX -03   INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY
HIGH ENERGY ASTROPHYSICS

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
The sodium iodide scintillator crystal detector, in phoswich configuration, operates over the energy range of 15 to 200 keV. The detector has a geometrical viewing area of 800 sq cm, an energy resolution of 18% at 60 keV, a field of view of 1 deg by 1 deg, a sensitivity at 80 to 180 keV of 9E(-6) photon/(sq cm-s-keV) per orbit or 9E(-8) photon/(sq cm-s-keV) in 3.5 days, and a sensitivity to lines of 1E(-4) photon/(sq cm-s) in 1E4 s. Shields are used in monitoring gamma-ray bursts.

------- SAX, UNKNOWN---

INVESTIGATION NAME- WIDE FIELD MULTIWIRE PROPORTIONAL COUNTER CAMERA

NSSDC ID- SAX -04 INVESTIGATIVE PROGRAM SCIENCE

INVESTIGATION DISCIPLINE(S) X-RAY ASTRONOMY HIGH ENERGY ASTROPHYSICS

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
This experiment consists of an array of three identical wide-field camera (WFC) units. Each wide-field camera or transform camera unit consists of a position-sensitive multiwire proportional counter coupled with a pseudo-random coded mask. Source X-ray photons in the range 2-30 keV will be selectively stopped by the mask frame producing the shadow of the mask pattern on the position-sensitive detector. Correlation and deconvolution analyses are used to reconstruct the image of the sky field and the spectra of the X-ray sources observed. Each WFC unit has a FWHM of 27 deg by 27 deg, a geometrical area of 600 sq cm, an energy resolution of 20% at 6 keV, and an angular resolution of 5 arc-min. By simultaneously imaging with all three cameras, 7% of the sky can be covered. The sensitivity of each WFC unit is 1.7E(-11) erg/(sq cm-s) in 1E4 s in the 2-6 keV waveband.

************************** SHEAL-A **************************

SPACECRAFT COMMON NAME- SHEAL-A
ALTERNATE NAMES- OSS-2

NSSDC ID- OSS-2

LAUNCH DATE- 03/00/88 WEIGHT- 3700. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 90. MIN INCLINATION- 28.5 DEG
PERIAPSIS- 296. KM ALT APOAPSIS- 296. KM ALT

PERSONNEL
MM - F.A. VOLPE NASA-GSFC
MS - F.E. MARSHALL NASA-GSFC

BRIEF DESCRIPTION
The Shuttle High Energy Astrophysics Laboratory-A (SHEAL-A) system consists of the space segment and the ground segment. The space segment includes the Shuttle, Shuttle Payload of Opportunity Carrier (SPOC) avionics, and individual corners for the instruments. The ground segment consists of the Tracking and Data Relay Satellite System (TDRSS) for data acquisition, the Payload Operations Control Center (POCC) for payload control, the Spacelab Data Processing Facility (SLDPF) for data capture and processing, and the data analysis facilities at various principal investigators' institutions. The investigations study the temperature and composition of high-temperature astrophysical plasmas on a scale of sizes and distances ranging from our own galaxy to clusters of galaxies. These investigations are part of the high-energy astrophysics program of multiple spacelab flights and extended space platform observations. The first flight in this series will contain only the Diffuse X-Ray Spectrometer (DXS) investigation and will be launched earlier. The other investigations described below will fly on subsequent flights.

------- SHEAL-A, GORENSTEIN---

INVESTIGATION NAME- LARGE AREA MODULAR ARRAY OF REFLECTORS (LAMAR)

NSSDC ID- OSS-2 -01 INVESTIGATIVE PROGRAM CODE EZ

INVESTIGATION DISCIPLINE(S) X-RAY ASTRONOMY

PERSONNEL
PI - P. GORENSTEIN SAO

BRIEF DESCRIPTION
The Large Area Modular Array of Reflectors (LAMAR) investigation is designed to obtain a sensitive view of regions of the X-ray sky over a broad wavelength band. It makes photometric maps of extended X-ray sources on 5 to 10% of the sky. The instrument consists of X-ray telescopes of the Kirkpatrick-Baez design, with imaging proportional counters (IPC) as focal plane detectors. Specifically, the LAMAR consists of two basic array subassemblies (BAS), array structure, central electronics assembly, aspect sensor, thermal blanket system, and supporting hardware. An attitude sensor and a pointing capability for specific targets are also included. Each BAS includes four telescope/IPC systems, a gas system, signal processing electronics, a self-supporting structure, and a sun shield. A system of fiducial lines compensates for alignment changes that occur as a result of variations in temperature. The axes of the LAMAR telescopes do not have to be precisely co-aligned.

------- SHEAL-A, KRAUSHAAR---

INVESTIGATION NAME- DIFFUSE X-RAY SPECTROMETER (DXS)

NSSDC ID- OSS-2 -02 INVESTIGATIVE PROGRAM CODE EZ

INVESTIGATION DISCIPLINE(S) X-RAY ASTRONOMY

PERSONNEL
PI - W. KRAUSHAAR U OF WISCONSIN

BRIEF DESCRIPTION
The objective of the Diffuse X-Ray Spectrometer (DXS) experiment is to make the first map of the temperature and composition of the medium over 1/40th of the celestial sphere, and LAMAR (OSS-2-01) supports these observations by indicating the contribution of point sources. This spectrometer contains four proportional counter X-ray detector assemblies which are operated in functionally identical pairs. The detector pairs are located on either side of the experiment pallet, and each is oscillated by an assembly about an axis parallel to the Shuttle roll axis. In each detector assembly, incident X-rays are Bragg-reflected from a curved crystal panel and passed through a collimator to the entrance window of a position-sensitive proportional counter. From a given position in the sky, only X rays of a particular wavelength are detected. The detector oscillation provides the scan for the full wavelength range of the detector for the given sky position. In the normal data acquisition mode, the oscillator drive rotates the detector pair back and forth through a selectable scan angle up to 180 deg, at a rate of 180 deg/min. A commandable X-ray tube source provides X rays of known energy for ground and in-orbit calibrations.

------- SHEAL-A, MEYER---

INVESTIGATION NAME- COSMIC RAY NUCLEI EXPERIMENT (CRNE)

NSSDC ID- OSS-2 -03 INVESTIGATIVE PROGRAM CODE EZ

INVESTIGATION DISCIPLINE(S) COSMIC RAYS

PERSONNEL
PI - P. MEYER U OF CHICAGO
PI - D. MULLER U OF CHICAGO

BRIEF DESCRIPTION
The Cosmic Ray Nuclei Experiment (CRNE) is a reflight of essentially the Spacelab-2 instrument (SPALAB-2-06), and extends observations of the cosmic ray nuclei in the approximate energy range from 100 to 1000 GeV/nucleon. The instrument measures the nuclear charge and the energy of each cosmic ray particle. It consists of a combination of two gas Cerenkov counters and two transition radiation detectors. Charge detection is determined by use of two large-area scintillators. A particle must pass through both scintillators to register a measured charge. Particle energy is measured by Cerenkov counters in the lower energy range and by the transition-radiation detectors in the higher energy range. Each one of the two gas Cherenkov counters is viewed by 48 photomultiplier tubes. Each transition-radiation detector consists of three radiators and three gas-filled multiwire proportional chambers.

------- SHEAL-A, SERLEMITSOS---

INVESTIGATION NAME- BROAD BAND X-RAY TELESCOPE (BBXRT)

NSSDC ID- OSS-2 -04 INVESTIGATIVE PROGRAM CODE EZ

INVESTIGATION DISCIPLINE(S) X-RAY ASTRONOMY

PERSONNEL
PI - P.J. SERLEMITSOS NASA-GSFC

BRIEF DESCRIPTION
The objective of the Broadband X-Ray Telescope (BBXRT) investigation is to perform high resolution energy-dispersive spectrophotometry over the range 0.5 to 10 keV on X-ray sources selected from a list containing stars, supernovae remnants, neutron stars, white dwarfs, clusters of galaxies, and active galactic nuclei including quasars. The instrument package consists of two identical co-aligned grazing incidence telescopes with cooled Si(Li) detectors at each focal plane. Observations will be conducted in a pointing mode for typically 2000 s per source. Events will be processed by a micro-processor-controlled data system which places them individually in a 64-kbs telemetry stream with 62.5 microseconds temporal resolution and 40-eV energy resolution. The BBXRT represents the first attempt to extend high-resolution spectroscopy beyond the Einstein spacecraft instrument's 3.5-keV cutoff to include the iron K band. Each

telescope has effective areas of approximately 350 sq cm and 125 sq cm at 1.5 and 7 keV, respectively, with a spatial accuracy of about 2 arc-min. Background reduction schemes result in an estimated limiting spectral sensitivity for a 2000-s observation of 1.E-13 erg/sq cm-s. The absolute pointing requirement is <=4 arc-min.

**************************** SIGMA ****************************

SPACECRAFT COMMON NAME- SIGMA
ALTERNATE NAMES-

NSSDC ID- SIGMA

LAUNCH DATE- 00/00/87 WEIGHT- 900. KG
LAUNCH SITE-
LAUNCH VEHICLE-

SPONSORING COUNTRY/AGENCY
FRANCE CNES
U.S.S.R. UNKNOWN

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 6480. MIN INCLINATION- DEG
PERIAPSIS- 2000. KM ALT APOAPSIS- 200000. KM ALT

PERSONNEL
PM - UNKNOWN

BRIEF DESCRIPTION
The main objective of the SIGMA mission is to obtain images of the sky in the hard X-ray and low-energy gamma-ray domain (30 keV - 2 MeV) with an angular accuracy of a few arc-min and a sensitivity for point sources of approximately 4E-11 erg/(sq cm-s) in the 2-6 keV waveband. Among the potential targets are over 100 galactic and extragalactic objects including the galactic center, interstellar clouds, Seyfert galaxies, BL Lac objects, quasars, clusters of galaxies, novae, and supernovae. SIGMA is in a highly eccentric orbit, which allows uninterrupted observations for 4 days per orbit from a region >60,000 km from the earth where the background and other properties remain stable. For more information, see P. Mandrou, "The Sigma Mission," Advances in Space Research, v. 3, pp. 525-531, 1984.

------- SIGMA, UNKNOWN --

INVESTIGATION NAME- X-RAY AND GAMMA-RAY IMAGING TELESCOPE

NSSDC ID- SIGMA -01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY
X-RAY ASTRONOMY

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
The instrument aboard SIGMA uses a position-sensitive detector of the Anger camera variety and a two-dimensional coded mask. A source at infinity projects a gamma-ray light and shadow pattern on the detector which is characteristic of the source position. The detector receives an image which is the superposition of all the shadow patterns from the sources in the field of view. The image of the sky is then reconstructed by calculating the correlation between the image function at the detector and the function representing all possible mask patterns. The detector consists of a 1.25-cm-thick NaI(Tl) crystal viewed by 61 hexagonal photomultipliers, held in place by a carbon fiber honeycomb structure glued to the crystal window. The instrument also contains an active anticoincidence shield made of CsI surrounding the detector. The mask is formed from 1.5-cm-thick tungsten and is located 2.5 m above the detector plane. The instrument has a detection-sensitive area of 825 sq cm, a resolution of 13 arc-min, a field of view of 6.3 x 6.8 deg and a localization accuracy of 1.7 arc-min. The weight of the instrument is 900 kg.

**************************** SLS-A ****************************

SPACECRAFT COMMON NAME- SLS-A
ALTERNATE NAMES- LIFE SCIENCES SPACELAB 1, SPACELAB 4

NSSDC ID- SPALAB4

LAUNCH DATE- 01/00/86 WEIGHT- KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 90.3 MIN INCLINATION- 28.5 DEG
PERIAPSIS- 296. KM ALT APOAPSIS- 296. KM ALT

PERSONNEL
MM - J. HARNAGE NASA-MSFC
MS - J. RUMMEL NASA-JSC
MG - R.A. SCHMITZ NASA HEADQUARTERS

BRIEF DESCRIPTION
Spacelab 4, Space Life Sciences Laboratory (SL-4), is the first life-science-dedicated Spacelab flight. Its objective is to investigate the effects of weightless exposure in a comprehensive interrelated fashion, using both human and animal subjects. The 15 experiments are conducted in the following four major areas of study: vestibular (-13, -15), cardiovascular/cardiopulmonary (-01, -04, -05, -08, -12, -14), metabolic/hematology (-02, -03, -07, -09, -10, -11), and general biology (-06). The SL-4 is a Long Module containing three Research Animal Holding Facilities (RAHF), Dynamic Environment Measurement System (DEMS), Urine Monitoring System (UMS) and a General Purpose Work Station (GPWS). The common test subjects are the six crew members, four squirrel monkeys in one RAHF, and 48 rats in two RAHFs. Instrumentation includes echocardiograph, gas analyzer mass spectrometer, physiological monitoring systems, ergometer, and mass measuring devices.

------- SLS-A, BLOMQUIST --

INVESTIGATION NAME- CARDIOVASCULAR ADAPTATION TO ZERO GRAVITY

NSSDC ID- SPALAB4-01 INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - C.G. BLOMQUIST U OF TEXAS, DALLAS
OI - F.A. GAFFNEY U OF TEXAS, DALLAS
OI - R.L. JOHNSON U OF TEXAS, DALLAS
OI - S. LEWIS PRKLND MEMRL HSPTL
OI - J.H. MITCHELL U OF TEXAS, DALLAS
OI - L.B. ROWELL U OF WASHINGTON

BRIEF DESCRIPTION
This investigation is one of six designed to provide sufficient data to evaluate cardiovascular/cardiopulmonary adjustments in zero gravity, as well as to examine closely individual elements such as the circulatory system, the capillary beds, the autonomic mechanisms, the heart, and the lungs. It involves humans and has a broad scope. Some of the new measurements included in this investigation are of the transient changes in the central venous pressure in very early phases of spaceflight, of the cardiac dimensions by echocardiography, and of the cardiovascular response to alpha and beta adrenergic stimulation using isoproterenol and phenylephrine.

------- SLS-A, DUNN --

INVESTIGATION NAME- REGULATION OF ERYTHROPOIESIS DURING SPACE FLIGHT

NSSDC ID- SPALAB4-02 INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - C.D.R.DUNN BAYLOR U
OI - R.D. LANGE U OF TENNESSEE

BRIEF DESCRIPTION
The objectives of this investigation and the two others in the hematology group are (1) to document blood volume losses during and following the flight, (2) to quantitatively examine several important pathways by which it is believed that erythropoiesis may be suppressed and to test whether red cell destruction is abnormal, and (3) to provide a number of comparable measurements in humans and rats to determine if the zero gravity rat response is a valid model of the human zero gravity response. This investigation uses rat specimens and shares the same group of animals as Johnson's experiment (SPALAB4 -09). Blood volumes are measured directly preflight and postflight, using appropriate tracers for red cell mass and plasma volumes. This investigation requires, among other items, tissues from the inflight animal harvest, bone marrow, and spleen tissue for culture analysis. Body mass and food and water consumption are carefully monitored.

------- SLS-A, DUNN --

INVESTIGATION NAME- INFLUENCE OF SPACEFLIGHT ON ERYTHROKINETICS IN MAN

NSSDC ID- SPALAB4-03 INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - C.D.R.DUNN BAYLOR U
OI - P.C. JOHNSON BAYLOR U
OI - C.S. LEACH NASA-JSC

BRIEF DESCRIPTION
The objectives of this investigation and the two others in the hematology group (SPALAB4-02, SPALAB4-09) are (1) to document blood volume losses during and following the flight, (2) to quantitatively examine several important pathways by which it is believed that erythropoiesis may be suppressed and to test whether red cell destruction is abnormal, and (3) to provide a number of comparable measurements in humans and rats to determine if the zero gravity rat response is a valid model of the human zero gravity response. This is the one investigation of the three that provides the human data.

------- SLS-A, ECKBERG---

INVESTIGATION NAME- INFLUENCE OF WEIGHTLESSNESS UPON HUMAN AUTONOMIC CARDIOVASCULAR CONTROL

NSSDC ID- SPALAB4-04 INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - D.L. ECKBERG VA COMMONWEALTH U
OI - G.E. MUSGRAVE VA COMMONWEALTH U

BRIEF DESCRIPTION
This investigation is one of six designed to provide sufficient data to evaluate cardiovascular/cardiopulmonary adjustments in zero gravity, as well as to examine closely individual elements such as the circulatory system, the capillary beds, the autonomic mechanisms, the heart, and the lungs. It will use humans, and study the reflex slowing of the heart by directly stimulating the carotid baroreceptors with the use of a rigid neck cuff capable of surrounding the neck with a sub-atmospheric pressure. This mechanical stimulation of the autonomic nervous system complements the pharmacological stimulation of the same reflex studied in Blomquist's experiment (SPALAB4-01).

------- SLS-A, FARHI---

INVESTIGATION NAME- INFLIGHT STUDY OF CARDIOVASCULAR DECONDITIONING

NSSDC ID- SPALAB4-05 INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - L.E. FARHI STATE U OF NEW YORK
OI - R.A. MORIN STATE U OF NEW YORK
OI - A.J. OLSZOWKA STATE U OF NEW YORK

BRIEF DESCRIPTION
This investigation is one of six designed to provide sufficient data to evaluate cardiovascular/cardiopulmonary adjustments in zero gravity, as well as to examine closely individual elements such as the circulatory system, the capillary beds, the autonomic mechanisms, the heart, and the lungs. Human specimens will be monitored. This investigation deals with the determination of cardiac output and other parameters of the respiratory function with the use of a mass spectrometer. The measurement of cardiac output is based on a novel, non-invasive, indirect Flick technique employing only respiratory gases.

------- SLS-A, FULLER---

INVESTIGATION NAME- THERMOREGULATION IN PRIMATES IN THE SPACE ENVIRONMENT

NSSDC ID- SPALAB4-06 INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - C.A. FULLER U OF CALIF, RIVERSIDE
OI - M.C. MOORE-EDE HARVARD MEDICAL SCHOOL
OI - F.M. SULZMAN STATE U OF NEW YORK

BRIEF DESCRIPTION
This investigation should provide a definitive answer to basic questions concerning the effect of spaceflight on the circadian rhythms of the primate and on the corresponding regulation of body temperature. The skin temperature measured at five sites, colonic temperature, ambient temperature, feeding and drinking activities, and heart rate of four squirrel monkeys (Saimiri sciureus) are all monitored continuously, and sampled automatically by a switching device. Each animal is exposed to the 12-h light/12-h dark cycle during flight.

------- SLS-A, HOLTON---

INVESTIGATION NAME- BONE, CALCIUM, AND SPACEFLIGHT

NSSDC ID- SPALAB4-07 INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - E.M. HOLTON NASA-ARC
OI - W.E. ROBERTS U OF PACIFIC DNTL SCH
OI - C.E. CANN U OF CALIF, SAN FRANC.
OI - T. WRONSKI U OF CALIF, SAN FRANC.

BRIEF DESCRIPTION
Using rats as subjects, this investigation studies the effects of weightlessness on bone metabolism. It involves an inflight tracer study with 40Ca administered continuously through the diet, with a recording of food and water consumption, and with the collection of waste trays. Postflight studies include determination of calcium turnover rate, osteoblast and osteoclast activities, and computer-aided microscopy examinations of the bone morphology.

------- SLS-A, HUTCHINS---

INVESTIGATION NAME- CORRELATION OF MICRO AND MACRO CIRCULATORY CHANGES DURING 0-G

NSSDC ID- SPALAB4-08 INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - P.M. HUTCHINS BOWMAN GRAY SCH MEDCN
OI - T.L. SMITH U OF MISSISSIPPI

BRIEF DESCRIPTION
This investigation is one of six designed to provide sufficient data to evaluate cardiovascular/cardiopulmonary adjustments in zero gravity, as well as to examine closely individual elements such as the circulatory system, the capillary beds, the autonomic mechanisms, the heart, and the lungs. This investigation shares the same rat specimens as Popovic's investigation (SPALAB4 -12). Together the results will provide a comprehensive study of the cardiovascular adaption to weightlessness in the rat, and will complement the results from the human investigation of Blomquist (SPALAB4 -01).

------- SLS-A, JOHNSON---

INVESTIGATION NAME- REGULATION OF BLOOD VOLUME DURING SPACE FLIGHT

NSSDC ID- SPALAB4-09 INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - P.C. JOHNSON BAYLOR U

BRIEF DESCRIPTION
The objectives of this investigation and the two others in the hematology group (SPALAB4-02, SPALAB4-03) are (1) to document blood volume losses during and following the flight, (2) to quantitatively examine several important pathways by which it is believed that erythropoiesis may be suppressed and to test whether red cell destruction is abnormal, and (3) to provide a number of comparable measurements in humans and rats to determine if the zero gravity rat response is a valid model of the human zero gravity response. This investigation uses rat subjects and will share the same group of animals as Dunn's investigation (SPALAB4 -02). An in vivo test is planned which will study red cell production in flight animals exposed to hypoxia for 3 consecutive postflight days. Blood collection and tracer injection are a few of the procedures that will be used.

------- SLS-A, LEACH --

INVESTIGATION NAME- FLUID-ELECTROLYTE REGULATION DURING SPACEFLIGHT

NSSDC ID- SPALAB4-10   INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - C.S.	LEACH	NASA-JSC
OI - P.C.	JOHNSON	BAYLOR U
OI - J.I.	LEONARD	MATSCO
OI - P.C.	RAMBAUT	NASA HEADQUARTERS
OI - W.N.	SUKI	BAYLOR U

BRIEF DESCRIPTION
This investigation and that of Moore-Ede (SPALAB4 -11) are collecting data that should result in resolving the question of whether the primate model is a valid animal model for the detailed study of the renal-endocrine area. This investigation provides the data for the human study. Daily food and water consumption is monitored, urine samples are collected daily (void-by-void), and blood samples are collected intermittently throughout the mission. Daily body mass measurements are performed on each human subject to permit drawing inferences regarding fluid loss, dietary adequacy, and overall metabolism. Extensive biochemical analysis of blood and urine will be performed postflight.

------- SLS-A, MOORE-EDE --

INVESTIGATION NAME- STUDY OF FLUID/ELECTROLYTE HOMEOSTATIS IN 0-G USING PRIMATES

NSSDC ID- SPALAB4-11   INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - M.C.	MOORE-EDE	HARVARD MEDICAL SCHOOL
OI - C.A.	FULLER	U OF CALIF, RIVERSIDE
OI - C.S.	LEACH	NASA-JSC
OI - F.M.	SULZMAN	STATE U OF NEW YORK

BRIEF DESCRIPTION
This investigation and that of Leach (SPALAB4 -10) are collecting data that should result in resolving the question of whether the primate model is a valid animal model for the detailed study of the renal-endocrine area. This investigation provides the data for the squirrel monkey subjects. Measurement of the central venous pressure in primates will be useful in assessing other wide ranging effects of the acute fluid shift. Daily food and water consumption is monitored, urine samples are collected daily (4-h pooled samples), and blood samples are collected intermittenly throughout the mission. Extensive biochemical analysis of blood and urine are performed postflight.

------- SLS-A, POPOVIC --

INVESTIGATION NAME- CARDIOVASCULAR ADAPTION OF WHITE RATS TO 0-G

NSSDC ID- SPALAB4-12   INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - V.P.	POPOVIC	EMORY U
OI - P.	POPOVIC	EMORY U

BRIEF DESCRIPTION
This investigation is one of six designed to provide sufficient data to evaluate cardiovascular/cardiopulmonary adjustments in zero gravity, as well as to examine closely individual elements such as the circulatory system, the capillary beds, the autonomic mechanisms, the heart, and the lungs. This investigation shares the same rat specimens as in Hutchins' investigation (SPALAB4 -08). Together their results provide a comprehensive study of the cardiovascular adaption to weightlessness in the rat, and will complement the results from the investigation of humans by Blomquist (SPALAB4 -01).

------- SLS-A, ROSS --

INVESTIGATION NAME- EFFECTS OF 0-G ON MAMMALIAN GRAVITY RECEPTORS

NSSDC ID- SPALAB4-13   INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - M.D.	ROSS	U OF MICHIGAN

BRIEF DESCRIPTION
This investigation involves an elaborate study of otoconial morphology in rats. It is conducted postflight (following an inflight animal sacrifice) to assess possible ultrastructural and functional changes. The possibility is explored that shifts in body fluids and changes in calcium, protein, and carbohydrate metabolism that occur in zero gravity, cause adverse effects upon the homeostatic processes in the inner ear that ordinarily preserve ion and fluid balance, resulting in damage to the otoconial complexes.

------- SLS-A, WEST --

INVESTIGATION NAME- PULMONARY FUNCTION DURING WEIGHTLESSNESS

NSSDC ID- SPALAB4-14   INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - J.B.	WEST	U OF CALIF, SAN DIEGO
OI - H.	GUY	U OF CALIF, SAN DIEGO
OI - C.F.	SAWIN	PERKIN-ELMER
OI - P.D.	WAGNER	U OF CALIF, SAN DIEGO
OI - D.B.	MICHELS	SCI & EDUCAT CONSULT

BRIEF DESCRIPTION
This investigation is one of six designed to provide sufficient data to evaluate cardiovascular/cardiopulmonary adjustments in zero gravity, as well as to examine closely individual elements such as the circulatory system, the capillary beds, the autonomic mechanisms, the heart, and the lungs. It studies the effects of weightlessness on human pulmonary function. A microprocessor coupled to a mass spectrometer is used in order that the test can be self-administered in minutes, providing measurements needed for a comprehensive pulmonary function assessment.

------- SLS-A, YOUNG --

INVESTIGATION NAME- VESTIBULAR EXPERIMENTS IN SPACELAB

NSSDC ID- SPALAB4-15   INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - L.R.	YOUNG	MASS INST OF TECH
OI - G.M.	JONES	MCGILL U
OI - K.E.	MONEY	D+C INST OF ENVIRN MED
OI - C.M.	OMAN	MASS INST OF TECH
OI - D.G.C.	WATT	MCGILL U

BRIEF DESCRIPTION
This investigation studies the nature of vestibular adaption by performing an assessment of human vestibular function using several different techniques with emphasis on otolith system measurements. A major objective is to investigate the sensory conflict theory by studying changes in human otolith function in weightlessness, and the relationship of vestibular sensitivity and stimulation to perception of orientation and space sickness. Vestibular interactions will be studied by measuring horizontal and vertical eye deviation during rotation, ocular torsion during linear and angular acceleration, leg electromyogram activity while falling (vestibulo-spinal reflex), and self-motion perception and ocular torsion during visually induced roll. Measurements of human perception changes will include descriptions of orientation, positioning of body parts, location of targets while blindfolded, and velocity perception during rotation and acceleration.

************************** SOLAR OPTICAL TELESCOPE ***********

SPACECRAFT COMMON NAME- SOLAR OPTICAL TELESCOPE
ALTERNATE NAMES- SOT-1, SUNLAB

NSSDC ID- SOT-1

LAUNCH DATE- 03/00/91   WEIGHT- 3635. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES   NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 93.8 MIN   INCLINATION- 57. DEG
PERIAPSIS- 460. KM ALT   APOAPSIS- 460. KM ALT

PERSONNEL

MG - E.	REEVES	NASA HEADQUARTERS
SC - E.	CHIPMAN	NASA HEADQUARTERS
PM - G.	HOGAN	NASA-GSFC
PS - S.D.	JORDAN	NASA-GSFC

BRIEF DESCRIPTION

The main objective of the Space Optical Telescope (SOT) is to achieve the high spatial resolution required for the determination of density, temperature, magnetic field, and non-thermal velocity field in solar features on the scale at which many basic physical processes occur. Such processes include changes in magnetic field strength, waves, single pulses, and systematic mass flows. To understand the flow of energy and mass on a global scale over the surface of the sun, it is necessary to investigate structures only slightly larger than the photon mean free path. SOT consists of two major parts: the telescope facility, which remains essentially unchanged from mission to mission; and the scientific instruments (SIs) which, depending upon the objectives, may vary from mission to mission. The telescope uses an on-axis Gregorian configuration with primary mirror 1.3 m in diameter. The paraboloidal primary mirror focuses light through a hole in a heat-rejection mirror allowing only 3 arc-min of the sun's 32-arc-min disk to be seen by the secondary mirror. The ellipsoidal secondary mirror reflects the image onto a flat tertiary mirror that directs the light beam off axis. Focal plane instruments, such as those selected for the SOT-1 mission, are positioned at the final or Gregorian focus. The telescope facility has an effective focal length of 31.25 m and a 151-micrometer arc-s plate scale. The SOT Observatory remains Shuttle-attached throughout the mission. It utilizes the Spacelab-provided instrument pointing system during on-orbit operations, and is mounted via launch locks directly to the Shuttle cargo bay during launch and landing. Mission operations are conducted by dual interactive control, either from the payload specialist station in the Shuttle aft flight deck or from ground-based stations in the payload operations control center.

------- SOLAR OPTICAL TELESCOPE, TITLE------------------------

INVESTIGATION NAME- COORDINATED FILTERGRAPH-SPECTROGRAPH

NSSDC ID- SOT-1 -01 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - A.M.	TITLE	LOCKHEED PALO ALTO

BRIEF DESCRIPTION

The coordinated filtergraph spectrograph (CFS) consists of a narrow band, visible light, tunable filtergraph and a visible and UV spectrograph. The cameras for both systems use large CCD arrays. The instrument exploits the superior spatial resolution, spectral range, and temporal repeatability of the SOT to study hydrodynamic and magnetic processes on spatial scales rarely, if ever, resolved from the ground. The instrument has an active image motion stabilization system to enable diffraction-limited performance and a dedicated experiment processor for experiment control and data flow management. Near simultaneous visible and UV observations follow the flows, energy, and magnetic fields continuously from the low photosphere into the corona. The co-investigators are listed in Appendix B9.

------- SOLAR OPTICAL TELESCOPE, ZIRIN------------------------

INVESTIGATION NAME- PHOTOMETRIC FILTERGRAPH

NSSDC ID- SOT-1 -02 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - H.	ZIRIN	CALIF INST OF TECH
OI - E.N.	FRAZIER	AEROSPACE CORP
OI - R.L.	MOORE	NASA-MSFC
OI - S.A.	MUSMAN	NASA-JPL
OI - J.H.	UNDERWOOD	NASA-JPL
OI - B.J.	LABONTE	MT WILSON+LAS CAMPANAS
OI - S.A.	SHEETMAN	MT WILSON+LAS CAMPANAS

BRIEF DESCRIPTION

The photometric filtergraph (PFG) for SOT consists of a pair of high-speed film cameras behind broad pass-band continuum filters. The PFG is combined with the coordinated filtergraph-spectrograph to form a single focal plane package for the SOT. The instrument exploits the superior spatial resolution, spectral range, and temporal repeatability of the SOT and records high resolution images of the solar atmosphere on photographic film. Filtergraphs are recorded in the visible and, as far as practicable, into the UV. The recorded data is for the study of granulation, surface flows, sunspots, and solar flares.

****************************** SPACELAB 2 ******************************

SPACECRAFT COMMON NAME- SPACELAB 2
ALTERNATE NAMES-

NSSDC ID- SPALAB2

LAUNCH DATE- 07/00/85 WEIGHT- 14500. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 92.5 MIN INCLINATION- 50. DEG
PERIAPSIS- 374. KM ALT APOAPSIS- 374. KM ALT

PERSONNEL

MM - R.E.	PACE	NASA-MSFC
MS - E.W.	URBAN	NASA-MSFC
MG - R.A.	KENNEDY	NASA HEADQUARTERS
SC - E.	WEILER	NASA HEADQUARTERS
PM - O.C.	JEAN	NASA-MSFC

BRIEF DESCRIPTION

Spacelab 2 consists of three pallets and a unique structure (called the Igloo) on which various instruments are exposed to the space environment. Spacelab 2 is presently scheduled to be flown for 7 days on STS 24 in April 1985. Included in the payload is the instrument-pointing system built by the European Space Agency (ESA) and designed to point the instruments at targets of opportunity. The following investigations have been chosen to fly on this mission: Vitamin D metabolites and bone demineralization, interaction of oxygen and gravity-influenced lignification, ejectable plasma diagnostics package, plasma depletion experiments for ionospheric and radio-astronomical studies, a small helium-cooled infrared telescope, elemental composition and energy spectra of cosmic ray nuclei between 50 GeV/nucleon and several TeV/nucleon, hard X-ray imaging of clusters of galaxies and other extended X-ray sources, solar magnetic- and velocity-field measurement system, coronal helium abundance Spacelab experiment, high-resolution telescope and spectrograph, solar UV spectral irradiance monitor, properties of superfluid helium in zero gravity, and vehicle charging and potential experiment.

------- SPACELAB 2, BANKS------------------------------------

INVESTIGATION NAME- VEHICLE CHARGING AND POTENTIAL (VCAP)

NSSDC ID- SPALAB2-14 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)

PERSONNEL

PI - P.M.	BANKS	STANFORD U
CI - K.D.	BAKER	UTAH STATE U
CI - N.	KAWASHIMA	ISAS
CI - T.	OBAYASHI	ISAS, U OF TOKYO
CI - W.J.	RAITT	UTAH STATE U
CI - P.R.	WILLIAMSON	STANFORD U

BRIEF DESCRIPTION

This multiple experiment uses several instruments for the data acquisition. Its purpose is to measure the charge accumulation on the Shuttle and the resulting potential of the vehicle. The scientific objectives are (1) to probe electron beam interactions in space plasma (in conjunction with the PDP to assess its character of propagation, wave emissions, particle scattering, ion heating processes, and microscopic plasma phenomena) in the vicinity of the Shuttle using the RMS, and at greater distances during planned flyaround maneuvers; (2) to study electromagnetic wave generation processes by attempting to generate low frequency waves which can propagate to other scientific satellites and/or ground receiving sites; (3) to measure vehicle charging processes by variations of the Shuttle potential and surface return currents using the charge and current probe (CCP) and spherical retarding potential analyzer/Langmuir probe (SRPA-LP) in modes developed during the STS-3 mission. Auroral electron precipitation as well as active electron emission are used to probe the vehicle electrical environment; (4) observe electrical processes associated with charging and discharging of vehicle dielectric surfaces; (5) to assess capabilities of measuring thermal plasma parameters from diagnostic instruments mounted in the pallet; and (6) to map the wave and particle distributions in the vicinity of the electron beam by joint experiments with the plasma diagnostics package (Spalab 2-03). The instruments to be used are (a) a CCP, (b) an SRPA-LP, (c) a fast-pulse electron gun (FPEG), and (d) a digital control and interface unit (DCIU).

BRIEF DESCRIPTION

PERSONNEL

------- SPACELAB 2, BRUECKNER-----------------------------------

INVESTIGATION NAME- HIGH RESOLUTION TELESCOPE AND SPECTROGRAPH (HRTS)

NSSDC ID- SPALAB2-10

INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - G.E.	BRUECKNER	US NAVAL RESEARCH LAB
OI - J.D.F.BARTOE		US NAVAL RESEARCH LAB
OI - O.K.	MOE	U OF OSLO
OI - K.R.	NICOLAS	US NAVAL RESEARCH LAB
OI - M.E.	VAN HOOSIER	US NAVAL RESEARCH LAB
OI - C.	JORDAN	OXFORD U

BRIEF DESCRIPTION

The objectives of this investigation are (1) the study of the energy transport and mass balance of the temperature minimum, chromosphere, transition zone, and corona in the quiet sun as well as in plages, flares, and sunspots; (2) the examination of the velocity field of the lower corona to study the origin of the solar wind; (3) the study of the structure and dynamics of spicules and superspicules in the UV spectrum; (4) the study of structure and dynamics of prominences; and (5) the study of pre-flare and flare phenomena. These objectives are obtained through intensity measurements, Doppler measurements, and line-profile analysis of high spatial resolution (1 arc-s) and high spectral resolution (5 pm) of UV spectra (wavelengths 117.6-170 nm) covering a wide variety of continua and emission lines that originate in different temperature regimes of the solar atmosphere. The instrumentation consists of a stigmatic spectrograph with a slit that covers the full solar radius simultaneously with 1000 resolution elements. Thus, the slit covers many different solar features at the same time. One spectrum contains enough information for a statistical analysis. Photographs of a series of spectra over a period of at least 15 min are made in order to follow the changes in the intensity, Doppler velocities, and line profiles as they are caused by disturbances moving through the solar atmosphere. Spectroheliograms of two dimensions as a function of time are constructed in order to investigate the three-dimensional structure of the chromosphere and transition zone. A systematic mapping of the coronal velocity field over the whole sun is also made, along with a series of limb spectra at different altitudes for studies of the structure and dynamics of spicules. The slit is pointed within a tolerance of half a slit width for a duration of at least 15 min. The slit of the high-resolution telescope and spectrograph (HRTS) is stepped in rapid sequence over a small area of the sun (plus or minus 5 arc-s), which allows the spectroheliograms to be made. The HRTS consists of a 30-cm Gregorian telescope of 90-cm focal length, a UV spectrograph, a 160-nm broad-band spectroheliograph, and an H-alpha split-display system housed in a thermal control canister mounted on the instrument pointing system (IPS). The telescope has an occulting mirror at the primary focus that reflects away all but a 5 x 15 arc-min portion of the solar image that then passes through an aperture to strike a secondary mirror that re-images it onto the UV Wadsworth spectrographic slit plate. The secondary mirror receives less than one solar constant of illumination. The spectral resolution is 50 mA, and the spatial resolution is 1 arc-s. The roll film camera holds 1000 exposures of type-101 film.

------- SPACELAB 2, BRUECKNER-----------------------------------

INVESTIGATION NAME- SOLAR UV SPECTRAL IRRADIANCE MONITOR (SUSIM)

NSSDC ID- SPALAB2-11

INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - G.E.	BRUECKNER	US NAVAL RESEARCH LAB
OI - J.D.F.BARTOE		US NAVAL RESEARCH LAB
OI - D.K.	PRINZ	US NAVAL RESEARCH LAB
OI - M.E.	VAN HOOSIER	US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

The objectives of this investigation are (1) to improve the accuracy of knowledge of the absolute solar fluxes; (2) to provide a highly accurate traceability of solar fluxes to a variety of UV radiation standards to establish long-term (solar cycle) variations; and (3) to measure the variability of solar fluxes in the wavelength range of 120-400 nm during several time periods, ranging from flare-produced changes to the variability from solar rotation. It is desired to (a) improve the absolute accuracy of solar continuum irradiance measurements in this wavelength range with a goal of plus or minus 6 to 10% (wavelength-dependent), (b) measure with high accuracy the intensities of the continuum below 208 nm relative to the intensities of the continuum above 208 nm with a goal of plus or minus 1%, (c) perform high-accuracy measurements of the intensities of solar emission lines relative to the stable solar continuum above 208 nm with a goal of plus or minus 1 to 5% (wavelength-dependent), and (d) improve the absolute accuracy of solar emission line irradiance measurements in the 120- to 400-nm region with a goal of plus or minus 6 to 10% (wavelength-dependent). The instrumentation consists of a solar UV spectral irradiance monitor. The monitor consists of two identical double-dispersion scanning spectrometers, seven detectors (five photodiodes and two photon counters), and a UV calibration light source. They are sealed in a canister filled with 1.1 atm of argon to eliminate the effects of contamination from high vacuum outgassing. One spectrometer is used almost continuously during the daylight portion of the solar-pointed orbit for measuring short-time variations of the UV solar flux (flare-related and slowly varying component). The other spectrometer is used only once a day to track any change in sensitivity of the first spectrometer. Two of the five photodiodes are used only once a day. A deuterium lamp calibrated in spectral irradiance is used as the transfer standard source for daily inflight calibration and stability tracking of both spectrometers and all seven detectors. The two photon counters obtain a spectral resolution of 0.1 nanometer over the whole wavelength range, while 5-nm resolution is obtained with the five photodiodes. A microprocessor controls all instrument functions by program instruction. Channels monitor the 121.6-nm line (Lyman alpha) and seven segments of the continuum from 145 to 390 nm. Eight narrow-band channels (0.1-nm resolution) are monitored continuously and scanned in five 0.1-nm steps. In the spectral scan mode (once a day) the spectrum from 120 to 400 nm is scanned at 0.1-nm resolution. In the narrow-band mode the solar spectrum and the deuterium lamp are scanned with both spectrometers; both are monitored in the broad-band mode.

------- SPACELAB 2, COWLES--------------------------------------

INVESTIGATION NAME- INTERACTION OF OXYGEN AND GRAVITY INFLUENCED LIGNIFICATION

NSSDC ID- SPALAB2-02

INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - J.R.	COWLES	U OF HOUSTON
OI - H.W.	SCHELD	U OF HOUSTON

BRIEF DESCRIPTION

The objectives of this investigation are to establish the effect of oxygen on lignin formation in plant tissue subjected to a weightless environment and to measure the relative amount of aromatic biosynthesis under different oxygen environments. The investigation distinguishes between two known factors, oxygen and gravity, that influence lignification in plants. Selected pregerminated seeds are planted in metabolic chambers and germinated just prior to launch. The chambers are closed and the atmospheric composition is adjusted by flushing known gas mixtures through rubber septa in the chamber walls. The O2 concentrations are 21% (for the control), 10% , and 3%. Each oxygen concentration is duplicated in another chamber module. Mercury vapor lamps are used to simulate sunlight during programmed day/night cycles throughout the mission. The investigation is also duplicated on earth at 1-g gravity and on a clinostat (ground controls).

------- SPACELAB 2, FAZIO---------------------------------------

INVESTIGATION NAME- SMALL, HELIUM-COOLED INFRARED TELESCOPE

NSSDC ID- SPALAB2-05

INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
DUST
ZODIACAL LIGHT
ASTRONOMY

PERSONNEL

PI - G.G.	FAZIO	SAO
OI - W.F.	HOFFMANN	U OF ARIZONA
OI - F.J.	LOW	U OF ARIZONA
OI - G.H.	RIEKE	U OF ARIZONA
OI - W.A.	TRAUB	SAO
OI - E.W.	URBAN	NASA-MSFC

BRIEF DESCRIPTION

The scientific objectives are as follows: (1) measurement and mapping of extended low-surface brightness infrared emission from the galaxy (the experiment is 500 times more sensitive than current balloon experiments at 500 micrometers, thus making possible extensive measurement of quantity, distribution, and temperatures of galactic dust and structure); (2) measurement of diffuse emission from intergalactic material and/or galaxies and quasars; (3) measurement of the zodiacal dust emission, especially if the H2O column density can be held to less than 1.E+12 molecules/sq cm; and (4) measurement of a large number of discrete infrared sources that overlap with the IRAS results. Spatial filtering provides measurements of the flux, spectral characteristics, positions, and sizes of discrete sources with high sensitivity. Technical objectives concerned with the measurement of the natural and spacecraft-induced infrared background and the determination of suitable techniques for the in-space use of superfluid helium and cryogenic telescopes are as follows: (1) to take environmental measurements of H2O, CO2, other

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from 15 to 140 km, depending upon the particular species measured. For most channels, vertical profiles of temperature

BRIEF DESCRIPTION

The objectives of this theoretical investigation are to

infrared-active molecules, dust particles, the effects of molecular deposition and cosmic rays, and the effects from the Shuttle environment on the performance of cooled infrared telescopes; (2) to prove the design of cooled infrared telescopes; and (3) to demonstrate the performance of a large superfluid helium Dewar system and measure some of its properties in space. The instrumentation consists of a small Herschelian telescope (15 cm in diameter with an f/4 off-axis) cooled to 3 deg K. It scans at the rate of 6 deg/s and covers a 90-deg arc across the sky. The focal plane contains 10 detectors, nine of which cover the region from 4 to 120 micrometers in three non-overlapping broad bands (4 to 9, 12 to 24, and 50 to 120 micrometers). One detector has a narrow-band response at the H2O and CO2 band locations (6 to 7 and 14 to 16 micrometers, respectively). The detectors cover a full 3 deg perpendicular to the scan direction. There is also a movable cold shutter to provide an absolute zero flux reference for each band. The stored liquid helium cooling system is composed of a liquid helium Dewar containing liquid helium at 1.5 deg K, a transfer line assembly, a vapor-cooled telescope cryostat, and a cryostat vacuum cover.

------- SPACELAB 2, FRANK---------------------------------------

INVESTIGATION NAME- EJECTABLE PLASMA DIAGNOSTICS PACKAGE

NSSDC ID- SPALAB2-03

INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - L.A.	FRANK	U OF IOWA
OI - J.	GREBOWSKI	NASA-GSFC
OI - D.A.	GURNETT	U OF IOWA
OI - N.	D'ANGELO	U OF IOWA
OI - D.L.	REASONER	NASA-MSFC
OI - N.H.	STONE	NASA-MSFC

BRIEF DESCRIPTION

The Plasma Diagnostic Package (PDP) is a fully instrumented ejectable subsatellite. During the mission it will operate within the payload bay, on the remote manipulator system (RMS), and as a free flyer. The objectives include the following: (1) to study Shuttle-magnetoplasma interactions in terms of density wakes, dc electric fields, energized plasma, and a variety of possible wave-particle instabilities; (2) to provide in situ measurements of the ionospheric plasma "holes" induced by the Shuttle engine burns in support of the ground radar observations of Spacelab 2 experiment 4 (Spalab 2-04); (3) to measure fields, waves, and plasma modifications induced by the Shuttle/Spacelab operating systems in the Spacelab bay and out to distances of 10 km; and (4) to observe natural waves, fields, and plasmas in the unperturbed magnetosphere. Instruments to be flown include the following: (1) a quadrispherical low-energy proton and electron differential analyzer to provide electron and proton distribution functions from 2 eV to 50 keV; (2) a plasma wave analyzer/electric dipole and magnetic search coil sensors to give components of electrostatic and electromagnetic waves from 5 Hz to 30 MHz; (3) a dc electric field meter for sensing components of the dc electric field over the range from 2 to 2000 mV/m; (4) a triaxial fluxgate magnetometer to measure the dc magnetic field distribution in the vicinity of the Shuttle; (5) a Langmuir probe to measure electron density in the region 1.E4 to 1.E7 per cc and electron temperature from 500 to 5000 deg K; (6) a retarding potential analyzer and differential flux analyzer to determine the energy distribution and streaming velocity direction for plasma ions with energies less than 16 eV, number densities of 1.E2 to 1.E7 per cc, temperatures from 500 to 1.E6 deg K, and velocities up to 15 km/s within plus or minus 50 deg of the instrument plane; and (7) an ion mass spectrometer for measuring from 1 to 64 u and densities of 20 to 2.E6 per cc. In addition to the PDP, the experiment consists of a special purpose end effector, a release mechanism, a receiver and data processing assembly, and an rf antenna assembly.

------- SPACELAB 2, GABRIEL-----------------------------------

INVESTIGATION NAME- SOLAR CORONAL HELIUM ABUNDANCE

NSSDC ID- SPALAB2-09

INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - A.H.	GABRIEL	RUTHERFORD APPLETON L.
PI - J.L.	CULHANE	U COLLEGE LONDON
OI - B.E.	PATCHETT	RUTHERFORD APPLETON L.
OI - P.	BORRILL	MULLARD SPACE SCI LAB
OI - K.	NORMAN	MULLARD SPACE SCI LAB
OI - J.	LANG	RUTHERFORD APPLETON L.
OI - J.H.	PARKINSON	U COLLEGE LONDON
OI - K.J.H.	PHILLIPS	RUTHERFORD APPLETON L.

BRIEF DESCRIPTION

The objectives of this investigation are (1) to determine the relative abundance of helium to hydrogen in the solar corona from the measurement of the photoexcitation of hydrogen Lyman alpha at 121.6 nm and helium II at 30.4 nm; (2) to determine the fundamental parameters of the coronal plasma such as electron density, temperature, and ionization balance as a function of radial distance above the limb; and (3) to construct a contour map in the intensity of selected extreme UV lines and in physical parameters (electron temperature and density) of coronal features with 15-arc-s resolution, both on the disk and above the limb of the sun. The instrumentation is composed of a 1-m, grazing-incidence spectrometer using a 1200-line/mm ruled grating. The sun's image is focused onto the entrance slit plane by means of a 28-cm focal length, grazing-incidence telescope of Wolter type-1 sector design. The slit is oriented tangentially to the solar limb, and can be stepped radially in steps of 1 arc-min from a position on the solar disk to 8 arc-min above the limb by a servo-driven linear traverse on the telescope mirror. Twelve channel electron multipliers are positioned behind different exit slits at pre-selected spectral positions on the Rowland circle. Two positions are at 121.6 nm and 30.4 nm (for H/He abundances). The other slits cover associated parameters, such as the temperature and density of the solar atmosphere. Some slits have attenuating filters for dynamic range of the ratio of the disk intensity to that of the corona at the distance of 3.5E5 km. Filters are removed for limb measurements. A small oscillatory rotation of the grating about an axis through the entrance slit permits a small wavelength scan to discriminate against scattered stray light. An auxiliary instrument monitors changes in He II 30.4 nm intensity caused by atmospheric absorption effects resulting from spacecraft height or changes of line of sight to the sun. A zero-order detector monitors the solar limb crossings and gives data on short-term intensity variations in stars for wavelengths shorter than 140 nm. Signals are counted, multiplexed, and interfaced with the Spacelab telemetry system for transmission to the ground. The pointing accuracy is 15 arc-s and the pointing stability is 5 arc-s.

------- SPACELAB 2, MASON---------------------------------------

INVESTIGATION NAME- PROPERTIES OF SUPERFLUID HELIUM IN ZERO-G

NSSDC ID- SPALAB2-13

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

PI - P.V.	MASON	NASA-JPL
OI - D.J.	COLLINS	NASA-JPL
OI - D.	PETRAC	NASA-JPL
OI - T.G.	WANG	NASA-JPL
OI - D.D.	ELLEMAN	NASA-JPL

BRIEF DESCRIPTION

The objectives of this investigation are to determine the fluid and thermal properties required for the design of planned space experiments using superfluid helium (2.2 deg K) as a cryogen, to advance scientific understanding of the interactions between superfluid and normal liquid helium, and to demonstrate the use of superfluid helium as a cryogen in zero gravity. Specifically, the objectives are (1) to take detailed measurements of low-frequency slosh modes of superfluid helium; (2) to take precise measurements of the thermal fluctuations and distributions in superfluid helium in zero gravity (the investigation performs at the microKelvin level over a frequency range of 0-100 Hz); (3) to develop an apparatus to measure the velocities and attenuation of quantized surface waves in superfluid films at frequencies so high that surface tension forces dominate over gravity forces and attenuation effects preclude their measurement on earth; and (4) to obtain superfluid helium cryostat performance data for future space applications. The instrumentation consists of an instrumented cryostat (containing an investigation package inside) and a support electronics package. The cavity is surrounded by a 90-l superfluid helium toroid and a multilayer super insulation system spaced by helium vapor-cooled shields. The Dewar operates in both upright and horizontal configurations. The cryostat is instrumented with germanium and thermocouple temperature sensors to monitor the chamber temperatures and the superfluid plug and insulation performance. Accelerometers monitor vibration effects in order to cross-correlate with the bulk behavior observations.

------- SPACELAB 2, MENDILLO-----------------------------------

INVESTIGATION NAME- PLASMA DEPLETION EXPERIMENTS FOR IONOSPHERIC + RADIO ASTRONOMICAL STUDIES

NSSDC ID- SPALAB2-04

INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
IONOSPHERES AND RADIO PHYSICS

heating, by the mean meridional circulation, and by eddies

average radius of curvature is

PERSONNEL

PI - M.	MENDILLO	BOSTON U
PI - P.A.	BERNHARDT	LOS ALAMOS NAT LAB
OI - M.D.	PAPAGIANNIS	BOSTON U
OI - M.C.	KELLEY	CORNELL U
OI - R.A.	HELLIWELL	STANFORD U
OI - M.B.	PONGRATZ	LOS ALAMOS NAT LAB
OI - D.J.	BAKER	UTAH STATE U
OI - R.D.	HARRIS	UTAH STATE U
OI - D.T.	FARLEY	CORNELL U
OI - D.	ANDERSON	NOAA-SEL

BRIEF DESCRIPTION

The objectives of this investigation are (1) to study the ionospheric (F-region) depletion and related effects caused by Shuttle thruster firings in mid-latitudes, (2) to determine the nature of the physical processes governing the ionospheric structure, including diffusion coefficients, chemical reaction rates, neutral wind velocities, electric fields, electron cooling rates, and limiting fluxes, (3) to produce controlled perturbations in the plasmasphere to examine the formation of artificial VLF ducts and the equatorial spread F, and (4) to use the ionospheric depletion region (hole) to conduct ground-based, high-resolution, radio astronomical studies. During flight, thrust firings from the orbital maneuvering system release a minimum of 200 kg of exhaust vapors over each of the radio astronomical sites of Westford, Mass.; Arecibo, Puerto Rico; Roberval, Quebec; Kwajalein; and Hobart, Tasmania, Australia. A study of airglow emissions is another of the scientific and technical goals.

------- SPACELAB 2, MEYER--

INVESTIGATION NAME- ELEMENTAL COMPOSITION AND ENERGY SPECTRA OF COSMIC RAY NUCLEI

NSSDC ID- SPALAB2-06

INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - P.	MEYER	U OF CHICAGO
PI - D.	MULLER	U OF CHICAGO
OI - J.E.	LAMPORT	U OF CHICAGO
OI - J.	L'HEUREUX	U OF CHICAGO
OI - S.	SWORDY	U OF CHICAGO

BRIEF DESCRIPTION

The objective of this investigation is to make a precise determination of the charge composition and individual energy spectra of cosmic ray nuclei from lithium to iron, covering the energy range from 50 to 2000 GeV/nucleon. The investigation exposes to deep space an instrument of large volume and considerable mass for an extended time period (without the influence of an overlying atmosphere). The instrument for charge composition is a telescope of two plastic scintillators; for the energy measurements, two gas Cerenkov counters covering the range from 50 to 150 GeV/nucleon and a transition radiation detector system for the region from 400 to 2000 GeV/nucleon are used. The detector elements are contained in a cylindrical pressurized shell with hemispherical top and bottom covers (2.8 m in diameter with a maximum height of 3.7 m). All detector elements comprise areas of 2 x 2 m. The transition radiation detector consists of six radiators (with a total of 10,000 plastic foils of 5-micrometer thickness) and six xenon-filled multiwire proportional chambers, and is positioned in the center of the instrument. One scintillator is adjacent to each end, and housed in a light integration box. The two gas Cerenkov counters fill the remaining space between the scintillators and hemispherical lids of the pressurized container. They are filled with gases at atmospheric pressure, and the inner walls are coated with white, highly reflective paint. There is a geometric factor of 5 sq m-sr for the transition detector and 1 sq m-sr for the Cerenkov counter telescope. To detect the light of an incident particle, 24 photomultiplier tubes with photocathodes 12.7 cm in diameter are used. Fast 5.08-cm photomultipliers are coupled directly to the scintillators, which are used for time delays between responses recorded by each scintillator; particles must penetrate both. Cerenkov radiation is detected by 50 photomultipliers with 12.7-cm windows. An electronics package collects the information from the various sensors and formats it for ground transmission.

------- SPACELAB 2, SCHNOES--

INVESTIGATION NAME- VITAMIN D METABOLITES AND BONE DEMINERALIZATION

NSSDC ID- SPALAB2-01

INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - H.K.	SCHNOES	U OF WISCONSIN
OI - H.F.	DE LUCA	U OF WISCONSIN
OI - E.M.	HOLTON	NASA-ARC

BRIEF DESCRIPTION

This experiment measures quantitatively the blood levels of biologically active Vitamin D metabolites of the Shuttle flight crew members to establish whether derangements of mineral (specifically calcium) metabolism reflect themselves in any way in a modulation of Vitamin D metabolism to its various metabolites. The experiment is composed of a developmental phase and a final phase. As part of the developmental phase, existing analysis methods for the Vitamin D metabolites are refined and new methods developed. The final phase consists of the quantitative analysis of the Vitamin D metabolites in plasma samples of the Spacelab 2 crew collected prior to, during, and after the flight. Flight hardware consists of two blood collection kits, a centrifuge to prepare the plasma, and a -20 deg C freezer for sample storage. All the equipment is located in the Shuttle mid-deck.

------- SPACELAB 2, TITLE--

INVESTIGATION NAME- SOLAR MAGNETIC AND VELOCITY FIELD MEASUREMENT SYSTEM

NSSDC ID- SPALAB2-08

INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - A.M.	TITLE	LOCKHEED PALO ALTO
OI - H.E.	RAMSEY	LOCKHEED PALO ALTO
OI - S.A.	SCHOOLMAN	LOCKHEED PALO ALTO
OI - T.D.	TARBELL	LOCKHEED PALO ALTO
OI - L.W.	ACTON	LOCKHEED PALO ALTO
OI - W.L.	LIVINGSTON	KITT PEAK NATL OBS
OI - J.W.	HARVEY	KITT PEAK NATL OBS
OI - R.W.	MILKEY	KITT PEAK NATL OBS
OI - G.W.	SIMON	USAF GEOPHYS LAB
OI - S.P.	WORDEN	USAF GEOPHYS LAB
OI - J.B.	ZIRKER	USAF GEOPHYS LAB

BRIEF DESCRIPTION

The objectives of this investigation are (1) to measure magnetic and velocity fields in the solar atmosphere with high spatial resolution and deduce the small-scale structure and evolution of these fields on the 10- to 20-min time scale of solar granulation; (2) to follow the evolution of solar magnetic structures over periods of 20 to 40 h in order to determine how the magnetic elements couple to the supergranule velocity patterns and by what mechanisms field diffusion and disappearance occur; (3) to study with high temporal and spatial resolution the magnetic field changes associated with transient events such as flares, and to isolate and follow the birth of sunspots, pores, and ephemeral regions; (4) to develop the elements of an H-alpha magnetograph/telescope that can be reflown; and (5) to provide a test of the pointing accuracy and stability of the instrument pointing system (IPS) to sub-arc-second accuracy. The instrumentation consists of a solar optical universal polarimeter mounted on the IPS. The polarimeter is composed of a tunable birefringent filter with a bandpass of 60 mA using associated blocking filters to permit the filter to operate in eight spectral bands, each about 0.8 nm wide. A film camera takes direct filtergrams through the tunable filter. A charge injection device (CID)-array camera takes photoelectric filtergrams with a high signal-to-noise ratio through the tunable filters. A video processor stores images in digital memory and a high-resolution, white-light system with film camera and video display is used for acquisition of accurate pointing data. The filter systems are interfaced to a 30-cm Cassegrain telescope with offset pointing capability. Rotatable wedges are placed in front of the telescope to allow it to observe any desired point on the sun. A guider assembly compensates for high-speed image motion. To record a complete line profile, filtergrams are taken in orthogonal polarizations at 15 wavelengths spaced 2 to 3.5 pm apart and in the near continuum. They are recorded on SO115 film with a resolution element of 50 micrometers per side.

------- SPACELAB 2, WILLMORE--

INVESTIGATION NAME- HARD X-RAY IMAGING OF CLUSTERS OF GALAXIES AND OTHER EXTENDED X-RAY SOURCES

NSSDC ID- SPALAB2-07

INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
X-RAY ASTRONOMY

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BRIEF DESCRIPTION

The objectives of this investigation are to study particulate matter with masses between 5.E-19 and 5.E-10 g in

PERSONNEL

PI - E.	KEPPLER	MPI-AERONOMY
OI - J.B.	BLAKE	AEROSPACE CORP

PERSONNEL
PI - A.P. WILLMORE — U OF BIRMINGHAM
OI - C.J. EYLES — U OF BIRMINGHAM
OI - G.K. SKINNER — U OF BIRMINGHAM

BRIEF DESCRIPTION
The purpose of this investigation is to examine the X-ray emission from clusters of galaxies in order to study the mechanisms involved in their emission and the possible presence of an intergalactic gas. The spatial and spectral distribution of X-ray flux from these clusters in the energy range from 2 to 20 keV is studied. The investigation is also used on other X-ray sources, such as those occurring at the center of our galaxy. These sources are extremely weak and require a pointing system to acquire sufficient observing time. The instrument is a double X-ray telescope that uses a technique to produce X-ray images of small regions of the sky at higher X-ray energies than is possible using conventional methods. It uses a coded binary mask and a position-sensitive detector that produces an X-ray map of the sky. The mask uses a special case of the random pinhole mask, which produces an image by deconvolving the pattern of the mask holes that produce a shadowgram on the position-sensitive detector when illuminated by radiation from the object. The two telescopes have different resolutions. One has a coarse resolution to detect faint sources and an extended region of stronger sources, while the other has a fine resolution that resolves fine details in more intense regions. The resolution values are 12 x 12 arc-min and 3 x 3 arc-min, respectively, at full width half maximum of the response and do not necessarily imply the limits to the fineness of the detail that can be deduced. The detectors are composed of multiwire position-sensitive proportional counters. Anti-coincidence techniques are used to reject cosmic-ray events. A motorized gimbal system is used to point the telescope to within 0.5 deg of any orientation with respect to the Shuttle. A microprocessor system accepts the nominal vehicle attitude to select a preprogrammed list of targets and to drive the telescopes. A gyro package for pointing, star sensors for determination of absolute directions to within 1 arc-min, and star field cameras for long-term drift motion are also part of the instrumentation.

*************************** SPACELAB 3 ***********************

SPACECRAFT COMMON NAME- SPACELAB 3
ALTERNATE NAMES-

NSSDC ID- SPALAB3

LAUNCH DATE- 04/00/85 — WEIGHT- 14500. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES — NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 92.0 MIN — INCLINATION- 57. DEG
PERIAPSIS- 350. KM ALT — APOAPSIS- 350. KM ALT

PERSONNEL
MG - S. SMITH — NASA HEADQUARTERS
SC - J.S. THEON — NASA HEADQUARTERS
PM - J. CREMIN — NASA-MSFC
PS - G.H. FICHTL — NASA-MSFC

BRIEF DESCRIPTION
Spacelab 3 consists of a Spacelab long module and a pallet. The primary objective of the mission is to conduct application, science, and technology experimentation requiring a low-gravity environment and an extended-duration (7 days) stable vehicle attitude. Payload specialists are sent into orbit to conduct the scientific investigations. The investigations selected for the Spacelab 3 mission are from the United States, France, and India. The experiments represent a total of five different disciplines, including materials science, life sciences, fluid mechanics, atmospheric science, and astronomy. Two of the investigations, one in materials science and one in astronomy, have already flown aboard Spacelab 1. Many of the Spacelab 3 investigations are scheduled to be modified and reflown on later missions to explore further the discoveries of this mission. Some of the experiments are located in the module, some on the pallet in the payload bay, and one in mid-deck. This is the first Spacelab mission in which a low-gravity environment will be strictly maintained in orbit.

------- SPACELAB 3, BISWAS -----------------------------------

INVESTIGATION NAME- IONIZATION STATES OF SOLAR AND GALACTIC COSMIC RAY HEAVY NUCLEI STUDIES (IONS)

NSSDC ID- SPALAB3-15 — INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS
PARTICLES AND FIELDS

PERSONNEL
PI - S. BISWAS — TATA INST OF FUND RES
CI - J.N. GOSWAMI — PHYSICAL RESEARCH LAB
CI - D. LAL — PHYSICAL RESEARCH LAB
CI - R. COWSIK — TATA INST OF FUND RES
CI - N. DURGAPRASAD — TATA INST OF FUND RES
CI - P.J. KAJAREKAR — TATA INST OF FUND RES
CI - M.N. VAHIA — TATA INST OF FUND RES
CI - J.S. YADAV — TATA INST OF FUND RES

BRIEF DESCRIPTION
This experiment was designed to study the recently discovered anomalous component of low-energy galactic cosmic-ray ions of C, N, O, Ne, and Ca to Fe of energy 5 to 100 MeV/u in regard to their ionization states, composition and intensity, and to study the ionization states of heavy elements from O to Fe in energetic solar particles emitted during flare events. The detector system serves for both studies, and consists of stacks of thin sheets of cellulose nitrate and lexan polycarbonate which are efficient low-noise detectors for heavy nuclei. The stacks are in the shape of a cylindrical module with a diameter of 40 cm and a height of approximately 5 cm. An energetic particle stopping in the stack leaves a damage trail along its path that can be revealed optically by postflight chemical treatment in the laboratory.

------- SPACELAB 3, CADORET ----------------------------------

INVESTIGATION NAME- MERCURIC IODIDE CRYSTAL GROWTH

NSSDC ID- SPALAB3-22 — INVESTIGATIVE PROGRAM
CODE EN/CO-OP

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - R. CADORET — CNES
CI - P. BRISSON — CNES

BRIEF DESCRIPTION
The experiment objective is to grow near-perfect single crystals of mercuric iodide (HgI_2) in a microgravity environment which will decrease the convection effects on crystal growth. The evaporation and condensation required for the crystal growth occurs within ampoule cartridges in a two-zone furnace having different temperatures at each end. The instrumentation includes two heat-pipe furnaces, each holding three cartridges, and six ampoule cartridges enclosing mercuric iodide seed crystals and source material. High-quality HgI_2 crystals can lead to improved X-ray and gamma-ray detectors.

------- SPACELAB 3, CALLAHAN ---------------------------------

INVESTIGATION NAME- RESEARCH ANIMAL HOLDING FACILITY (RAHF)

NSSDC ID- SPALAB3-11 — INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
PLANETARY BIOLOGY

PERSONNEL
PI - P.X. CALLAHAN — NASA-ARC
PI - J.W. TREMOR — NASA-ARC

BRIEF DESCRIPTION
The objectives of the Research Animal Holding Facilities (RAHF) Verification Test are (1) to evaluate operational requirements and procedures for the preflight, launch, flight, reentry, landing, and postflight handling and care of selected animal specimens; (2) to provide a final biocomparability assessment between animals and the RAHF under weightless conditions and closed life support systems; (3) to obtain operational experience; and (4) to perform a study of the physiological and behavioral changes that occur as a consequence of containment in the RAHF during spaceflight. Twenty-four rats are flown in one RAHF unit. Primates (four squirrel monkeys) are flown in the other. Other than visual and photographic observation of the animals, no interface with the animal payload will be required except normal housekeeping operations. RAHF operation and animal/RAHF interfaces are fully documented by visual means, by taped verbal comments, by written notes, and photographically by using 16-mm motion picture and 35-mm still cameras. After recovery of animals, behavior is monitored, and physiological data are obtained to compare with inflight data and ground control animals. In conjunction with the RAHF experiment there are two measuring systems, the Dynamic Environment System (DEMS) and the Biotelemetry System (BTS). The DEMS, designed to measure noise, vibration, and acceleration forces is mounted between the two RAHF units. The BTS measures the deep body temperature, heart rate and ECG pattern of the four squirrel monkeys and of four of the rats. Wireless sensors are implanted in the animals before flight.

PERSONNEL
PI - J.A. SIMPSON — U OF CHICAGO
OI - J.D. ANGLIN — NATL RES COUNC OF CAN

the ambient electron density. The instrument has a mass of 7.3 kg, excluding antennas and booms, and has a data rate of 116 bps in storage mode and 232 bps in tracking mode. It uses 9.9

------- SPACELAB 3, COURTES--

INVESTIGATION NAME- VERY WIDE FIELD CAMERA

NSSDC ID- SPALAB3-25 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
ZODIACAL LIGHT
ASTRONOMY

PERSONNEL

PI - G.C.	COURTES	CNRS-LAS
CI - M.	VITON	CNRS-LAS
CI - J.P.	SIVAN	CNRS-LAS
CI - R.	DECHER	NASA-MSFC
CI - G.A.	GARY	NASA-MSFC

BRIEF DESCRIPTION
This experiment takes advantage of the favorable nighttime viewing conditions offered by the Spacelab 3 orbit to make a general ultraviolet survey of the celestial sphere using the instrument flown for a similar purpose on Spacelab 1. The camera-telescope is mounted in the Spacelab scientific airlock, from which it takes wide-angle pictures of the sky at UV wavelengths (1300 to 3000 A). The instrument can operate in two modes to photograph the sky through three different filters and to measure the wavelength distribution across the UV band. The 54-deg field of view permits studies of the large-scale structure of our galaxy and also of the remnants of large explosions that occurred eons ago in the sun's vicinity. About 100 exposures are planned for this mission.

------- SPACELAB 3, COWINGS--

INVESTIGATION NAME- AUTOGENIC FEEDBACK TRAINING

NSSDC ID- SPALAB3-23 INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
PLANETARY BIOLOGY

PERSONNEL

PI - P.	COWINGS	NASA-ARC
CI - J.	KAMIYA	U OF CALIF, SAN FRANC.
CI - W.	TOSCANO	U OF CALIF, SAN FRANC.
CI - N.	MILLER	ROCKEFELLER U.
CI - J.	SHARP	NASA-ARC

BRIEF DESCRIPTION
The two major activities of this investigation are preflight crew training in recognizing and controlling earth motion sickness, and inflight attempts to recognize and control symptoms of space motion sickness (space adaptation syndrome). Three crew members, who had received the preflight training for this experiment, are instrumented for a biofeedback technique known as autogenic feedback training and these three constitute the treatment group. The rest of the participants are the control group. In flight, all participants wear the same instrumentation during each 12-h workshift. The electronic instruments continuously measure and record heart rate, respiration rate and volume, basal skin response (sweat), and blood volume pulse. A small accelerometer worn on the head measures head and body movements, which seem to be associated with space motion sickness. The physiological data are also displayed on a small monitor worn on the wrist. Upon waking, all participants don their instrumentation and check their physiological responses. In addition, the treatment group rates nine symptoms such as pallor, stomach awareness, or nausea, from mild to moderate to severe, on a checklist which is later compared to actual recorded physiological data to correlate specific symptoms and body functions. Any discomfort is recorded by the subject, and an attempt is made to control it mentally.

------- SPACELAB 3, FARMER--

INVESTIGATION NAME- ATMOSPHERIC TRACE MOLECULES OBSERVED BY SPECTROSCOPY (ATMOS)

NSSDC ID- SPALAB3-14 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
METEOROLOGY

PERSONNEL

PI - C.B.	FARMER	NASA-JPL
CI - O.	RAPER	NASA-JPL
CI - R.	NORTON	NASA-JPL
CI - R.	BEER	NASA-JPL
CI - F.W.	TAYLOR	OXFORD U
CI - M.T.	CHAHINE	NASA-JPL
CI - R.	TOTH	NASA-JPL
CI - R.	SCHINDLER	NASA-JPL
CI - J.	BRECKINRIDGE	NASA-JPL
CI - J.H.	SHAW	OHIO STATE U
CI - J.	SUSSKIND	NASA-GSFC
CI - J.M.	RUSSELL, 3RD	NASA-LARC
CI - R.	ZANDER	U OF LIEGE
CI - J.E.	HARRIES	RUTHERFORD APPLETON L.
CI - S.	WOFSY	HARVARD U

BRIEF DESCRIPTION
The primary purpose of the Atmospheric Trace Molecules Observed by Spectroscopy (ATMOS) experiment is to demonstrate the capability to monitor environmental quality by surveying the atmosphere for trace constituents and identifying their sources, flow patterns, and decay mechanisms. In its most general form, the ATMOS experiment objective is to determine concentration profiles for a large number of stratospheric species for altitudes from 20 to 80 km and with a vertical resolution of 2 km. The ATMOS instrument views the sun through the stratosphere and measures the spectral absorption of solar energy. Each data-taking run is initiated prior to the sun emerging from or disappearing behind the earth. Data from the instrument for these sunrise and sunset limb encounters are interferograms that, when processed on the ground, provide absorption spectra. The instrument is a continuous-scanning Fourier spectrometer operating in the 2- to 16-micrometer wavelength region and capable of generating one interferogram each second with a spectral resolution of 0.01 (1/cm). ATMOS consists of four major systems: a suntracker for precise solar pointing, an input optical system that includes a telescope and a data handling system, an interferometer for wavelength measurements, and an infrared detector sensitive to radiation in the 3- to 16-micrometer wavelength range. The data in conjunction with engineering and housekeeping data are converted into a serial PCM bit stream in a format compatible with the Spacelab high-rate, real-time telemetry system.

------- SPACELAB 3, HALLINAN--

INVESTIGATION NAME- AURORAL IMAGING EXPERIMENT

NSSDC ID- SPALAB3-24 INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL

PI - T.J.	HALLINAN	U OF ALASKA
CI - D.L.	LIND	NASA-JSC

BRIEF DESCRIPTION
In this investigation a sensitive B/W television camera (standard flight equipment in the Shuttle) is used to record changing auroras over the Northern Hemisphere (primarily North America). Auroras within 3200 km of the Shuttle should be visible. During more than 40 prime observation opportunities, the Shuttle passes within 800 km of the auroras, and its path allows observations of hundreds of kilometers of auroras in a few minutes. The observations occur in periods of 10 min or less and in groups of up to 10 consecutive orbits each day. The video images are supplemented with color still photographs taken by crew members. Since different colors represent different interactions, these photographs provide information about auroral chemistry and physics. The orbital velocity is such that images made a fraction of a second apart form stereo pairs from which the three-dimensional structure and form of most of the aurora can be constructed. This may allow investigators to separate overlapping forms and distinguish individual features. Full automation is unsuited to this investigation, because human judgment of targets and camera adjustments is needed for maximum scientific return. The principal investigator provides the crew with current information on predicted auroral activity, types of observations with priority for the day, and evaluations of previous ones. Analysis of the data can aid in determining when and where flickering auroras occur, and the frequencies of pulsating auroras. These auroral types are not well understood and are of special interest as possible indicators of events deep in the magnetosphere.

------- SPACELAB 3, HART--

INVESTIGATION NAME- GEOPHYSICAL FLUID FLOW CELL (GFFC)

NSSDC ID- SPALAB3-10 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

PI - J.E.	HART	U OF COLORADO
CI - P.A.	GILMAN	HIGH ALTITUDE OBS
CI - G.H.	FICHTL	NASA-MSFC
CI - W.	FOWLIS	NASA-MSFC
CI - J.	TOOMRE	U OF COLORADO
CI - F.W.	LESLIE	NASA-MSFC

BRIEF DESCRIPTION
The purposes of this experiment are to simulate density stratified flows which occur naturally in the atmospheres of rotating planets and stars, and to gain insights and answers to basic questions concerning large-scale fluid flows in oceans, atmospheres and stars. Simulation is accomplished through the use of a dielectric fluid that is temperature-dependent and confined between concentric, rotating, electrically conductive spherical shells. The apparatus includes a convection cell, temperature controllers, rotation drive, and a high voltage supply. A camera is used to view the flow pattern made visible by injection of dyes, or from the distortion of a set of ruled lines on the outer shell caused by refractive index changes in

S-band, at 2375 MHz. Altimetry and radiometry investigations are accomplished by utilizing various operating modes. See Appendix B11 for a listing of the investigators.

------- VENUS RADAR MAPPER, SJOGREN--

------- VIKING SWEDEN, ANGER--

INVESTIGATION NAME- ULTRAVIOLET AURORAL IMAGER

NSSDC ID- VIKING -01 INVESTIGATIVE PROGRAM
SCIENCE

NSSDC ID- SPALAB3-01 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - R.B. LAL ALABAMA A+M U
CI - R.L. KROES NASA-MSFC

BRIEF DESCRIPTION
In this investigation triglycine sulfate (TGS) crystals are grown by a low-temperature solution growth technique. The objectives are (1) to develop a technique for solution crystal growth in a low-gravity environment, (2) to characterize the growth environment and to determine its influence on growth behavior, and (3) to determine how growth in a low-gravity environment influences the properties of a resultant TGS crystal. Growth is accomplished by slowly extracting heat at a controlled rate through a seed crystal of TGS suspended on an insulated string in a saturated solution of TGS in a test cell. Variations in the liquid density, solution concentration, and temperature around the growing crystal are studied using schlieren, shadowgraph, and interferometric techniques. Growth in earth gravity is also studied similarly. It is expected that convective flow, found in earth-based studies, is minimized in space, allowing a slow, uniform growth resulting in a higher degree of perfection. Such crystals have practical applications as infrared detectors.

------- SPACELAB 3, SCHNEIDER------------------------------------

INVESTIGATION NAME- URINE MONITORING

NSSDC ID- SPALAB3-18 INVESTIGATIVE PROGRAM
CODE EB

INVESTIGATION DISCIPLINE(S)
PLANETARY BIOLOGY

PERSONNEL
PI - H. SCHNEIDER NASA-JSC

BRIEF DESCRIPTION
The primary objectives of the Urine Monitoring System (UMS) are (1) to verify the operation of the UMS in the collection and sampling of urine, (2) to perform inflight measurement calibration of the UMS, (3) to develop and use a feasible procedure for monitoring crew water intake, using the existing galley water supply and Shuttle food system, and (4) to verify the system for preparing urine samples for postflight analysis. The UMS unit, installed in the Shuttle middeck, accommodates eight crew members. The urine collection portion of this investigation requires urine volume measurements on all crew members. Urine samples for two designated crew members are collected, stored, and returned for analysis to determine if and how their body chemistry changes during the mission. Postflight measurements on the urine samples include indices of renal function and electrolyte, protein, and hormone levels.

------- SPACELAB 3, SCHNEPPLE------------------------------------

INVESTIGATION NAME- MERCURIC IODIDE GROWTH
VAPOR CRYSTAL GROWTH SYSTEM (VCGS)

NSSDC ID- SPALAB3-02 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - W.F. SCHNEPPLE EG+G INC
CI - L. VAN DEN BERG EG+G INC
CI - M.M. SCHIEBER EG+G INC

BRIEF DESCRIPTION
The purpose of this experiment is to grow more perfect mercuric oxide crystals by diffusion-controlled growth conditions. Such crystals have practical importance as sensitive X-ray or gamma-ray detectors that can operate at an ambient temperature rather than liquid nitrogen temperature, as is usually required by other detectors. The crystals are grown by vaporization at 110 deg C and by recondensation at 40 deg C in a specially designed furnace in the Vapor Crystal Growth System. Crew members can reverse the growth procedure if polycrystalline growth begins (which is a common problem on the ground). Growth is observed through an optical assembly.

------- SPACELAB 3, WANG---

INVESTIGATION NAME- DYNAMICS OF ROTATING AND OSCILLATING
FREE DROPS

PERSONNEL
PI - T.G. WANG NASA-JPL
CI - E.H. TRINH NASA-JPL
CI - D.D. ELLEMAN NASA-JPL

BRIEF DESCRIPTION
The experiment objective is to perform basic experiments on the dynamics of rotating and oscillating liquid drops, using a Drop Dynamics Module. The module consists of an acoustical chamber with three sources that generate, in three different directions, sound waves of variable frequency and amplitude. The sound waves will be used to rotate and oscillate water and silicone drops and to position the drops in a field of view. Detailed objectives of the rotation experiment are to determine (1) bifurcation points, (2) instability at bifurcation points, (3) hysteresis of bifurcation points, (4) equilibrium shapes of drops, and (5) oscillations of the rotating drops. Objectives concerning oscillations of rotating drops are to determine (1) frequency of large-amplitude oscillations, (2) damping of large-amplitude oscillations, (3) shaping of these oscillations, (4) mode coupling in oscillations, and (5) effect of turbulent flow on relationships between amplitude and frequency/damping of a mode.

*************************** SPACELAB D-1**********************

SPACECRAFT COMMON NAME- SPACELAB D-1
ALTERNATE NAMES-

NSSDC ID- SPLABD1

LAUNCH DATE- 10/00/85 WEIGHT- KG
LAUNCH SITE-
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
FED REP OF GERMANY DFVLR
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 90.7 MIN INCLINATION- 57. DEG
PERIAPSIS- 325. KM ALT APOAPSIS- 325. KM ALT

PERSONNEL
MM - R. BENSON NASA HEADQUARTERS
PM - H. STEIMLE DFVLR

BRIEF DESCRIPTION
The primary objective of the Spacelab D-1 mission is to conduct basic and applied materials processing research in the Spacelab module funded by DFVLR, and in the Materials Experiment Assembly (MEA) funded by NASA. In addition to materials processing investigations, the payload contains life sciences investigations and one communication-navigation investigation. The investigations cover mainly the fields of fluid physics, solidification of crystals and metals, and human and plant responses to weightlessness. Most of the investigators are German; however, there are researchers from France, Italy, the Netherlands, Spain, Switzerland, and the United States. The foreign investigations in the materials science discipline will use the following three facilities: a Material Laboratory which includes isothermal heating equipment, mirror heating equipment, gradient heating equipment (CNES), a fluid physics module, a cryostat, a high temperature thermostat, and an ultra-high vacuum chamber; the MEDEA structure which includes gradient heating equipment with quenching capability, a mono-ellipsoidal mirror furnace, and a high precision thermostat; and the Process Chamber which includes a holographic diagnostic unit, an interdiffusion in salt solutions experiment, and a convection experiment. The U.S. investigators in this discipline will use the MEA facility which supports investigations in vapor crystal growth, immiscible alloy solidification, and containerless processing of glass-forming melts. Many of the life sciences investigations are performed using two facilities and some additional equipment. These facilities are the BIORACK which includes a cooler/freezer combination, one incubator for the 18-30 deg C range, a second incubator for the 30-40 deg C range, and a glovebox; and the Vestibular Sled which includes the sled unit, the human vestibular system experiment, and the space motion sickness experiment. The single navigation/communications investigation (NAVEX) includes a clock synchronization and time distribution experiment, and a one-way distance measurement experiment. The Long Module will contain three Spacelab double racks for the materials science facilities and three single racks for life sciences investigations. The crew will include NASA mission specialists and two foreign payload specialists.

PERSONNEL
PI - A. BAHNSEN DANISH SPACE RES INST
CI - M. JESPERSEN DANISH SPACE RES INST
CI - E. UNGSTRUP DANISH SPACE RES INST
CI - B. HOLBACK UPPSALA IONOSPHER OBS
CI - R.E. GENDRIN CNET

For the axial probes all three electrodes are 10 cm long. The accuracy of the measurements depends critically on the probe guard and tip potentials relative to the surrounding plasma potential. For negative potential, probe current is essentially saturated to the photo-emission current carried by electrons leaving the probe; the plasma ion current is

***************************** SPARTAN HALLEY ************************

SPACECRAFT COMMON NAME- SPARTAN HALLEY
ALTERNATE NAMES-

NSSDC ID- SPATN-H

LAUNCH DATE- 01/00/86 WEIGHT- KG
LAUNCH SITE-
LAUNCH VEHICLE-

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PERSONNEL

MM - M.	WINDSOR	NASA-GSFC
MG - J.A.	GLAAB	NASA HEADQUARTERS
SC - H.C.	BRINTON	NASA HEADQUARTERS
PS - W.M.	NEUPERT	NASA-GSFC

BRIEF DESCRIPTION

Spartan consists of low-cost, Shuttle-launched, short-duration, sounding-rocket-type payloads. The payloads are retrievable and reusable with a turnaround time of approximately 6 to 9 months. Spartan has relatively few operational interfaces with STS. It operates as an autonomous sub-satellite, and the data are stored on an internal tape recorder. Pointing and stabilization are achieved by an attitude control system capable of three-axis stabilized pointing to any target within plus or minus 3 arc-min. The main objective of this spacecraft is to obtain UV spectra of the coma and tail of Comet Halley in January 1986 shortly before its perihelion. It is scheduled to be carried on the STS 61-D flight, and can operate for up to 48 hours.

------- SPARTAN HALLEY, BARTH----------------------------------

INVESTIGATION NAME- UV SPECTROMETER

NSSDC ID- SPATN-H-01 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
DUST
INTERPLANETARY PHYSICS

PERSONNEL
PI - C.A. BARTH U OF COLORADO

BRIEF DESCRIPTION

The objective of this investigation is to obtain UV spectra of the coma and tail of Comet Halley shortly before its perihelion, in order to determine the rates of production of O, and OH-, and to relate the production of these species to the photodissociation of water. In addition, a search will be made for various nitrogen-, carbon-, and sulfur-containing molecules and radicals. The instrument consists of two identical Ebert-Fastie spectrometers, one covering the wavelength range 1250 to 1660 A and the other covering 1600 to 3200 A. The wavelength resolution is approximately 2 A. The instrument is similar to ones flown on the Mariner 6, 7, and 9 spacecraft. Although the comet-sun angle will be less than 45 deg at the time of the mission, unwanted sunlight effects will be eliminated by using a sunshade and by using the earth as an occulter. Two space-qualified Nikon F-3 cameras will be used to reconstruct the precise history of the pointing direction during the data-gathering periods and to provide a record of the large-scale activity of the comet during the mission, including nuclear outbursts, comal asymmetries, and the angle of separation of the dust tail from the ion tail.

***************************** SPARTAN-A ***************************

SPACECRAFT COMMON NAME- SPARTAN-A
ALTERNATE NAMES- SPARTAN 1

NSSDC ID- SPATN-A

LAUNCH DATE- 06/12/85 WEIGHT- 1100. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 90.3 MIN INCLINATION- 28.5 DEG
PERIAPSIS- 296. KM ALT APOAPSIS- 296. KM ALT

PERSONNEL

MM - D.J.	SHREWSBERRY	NASA-GSFC
MS - R.G.	CRUDDACE	US NAVAL RESEARCH LAB
MG - J.A.	GLAAB	NASA HEADQUARTERS
SC - L.J.	KALUZIENSKI	NASA HEADQUARTERS
PS - W.M.	NEUPERT	NASA-GSFC

BRIEF DESCRIPTION

Spartan consists of low-cost, Shuttle-launched, short-duration, sounding-rocket-type payloads. The payloads are retrievable and reusable with a turnaround time of approximately 6 to 9 months. Spartan has relatively few operational interfaces with STS. It operates as an autonomous sub-satellite, and the data are stored on an internal tape recorder. Pointing and stabilization are achieved by an attitude control system capable of three-axis stabilized pointing to any target within plus or minus 3 arc-min. Spartan-A, as the first of the series, is intended to demonstrate the low-cost approach and its ability to achieve the desired technical performance in the STS environment. The scientific objective of the spacecraft is to investigate the photon emission processes in clusters of galaxies and to explore the center of our galaxy in the photon energy range of 0.5 to 15 keV. The spacecraft will allow the instrument to scan various cosmic sources at rates of 10 to 20 arc-s per s.

------- SPARTAN-A, FRITZ---------------------------------------

INVESTIGATION NAME- X-RAY PROPORTIONAL COUNTERS

NSSDC ID- SPATN-A-01 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
DUST
INTERPLANETARY PHYSICS

PERSONNEL
PI - G.G. FRITZ US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

This experiment consists of two large X-ray proportional counters equipped with collimators constructed from stacked-etched grids, plus aspect cameras, detector gas supply, and electronics. The photon energy range covers 0.5 to 15 keV. Because of alignment considerations, the collimators, aspect cameras, and the attitude control star tracker and gyro components are mounted on a common optical bench, which is attached to the spacecraft structure through kinematic mounts that eliminate flexing of the optical bench due to mechanical or thermal loads. The instrument has been flown numerous times on sounding rocket flights.

***************************** SPARTAN-B ***************************

SPACECRAFT COMMON NAME- SPARTAN-B
ALTERNATE NAMES- SPARTAN 2

NSSDC ID- SPATN-B

LAUNCH DATE- 10/00/86 WEIGHT- 1100. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 90.3 MIN INCLINATION- 28.5 DEG
PERIAPSIS- 296. KM ALT APOAPSIS- 296. KM ALT

PERSONNEL

MM - J.H.	LANE	NASA-GSFC
MS - J.	KOHL	HARVARD COLLEGE OBS
MG - J.	GLAAB	NASA HEADQUARTERS
SC - D.	BOHLIN	NASA HEADQUARTERS
PS - W.	NEUPERT	NASA-GSFC

BRIEF DESCRIPTION

Spartan consists of low-cost, Shuttle-launched, short-duration, sounding-rocket-type payloads. The payloads are retrievable and reusable with a turnaround time of approximately 6 to 9 months. Spartan has relatively few operational interfaces with STS. It operates as an autonomous sub-satellite, and the data are stored on an internal tape recorder. Pointing and stabilization are achieved by an Attitude Control System (ACS) capable of plus or minus 30 arc-s accuracy. Spartan-B carries solar physics instruments which are used to probe the physics of the acceleration of the solar wind by measuring temperatures, particle densities, and velocities between 1.5 and 6 solar radii. The instruments have flown together successfully three times on Nike-Black Brant sounding rockets.

------- SPARTAN-B, KOHL--

INVESTIGATION NAME- UV CORONAL SPECTROMETER

NSSDC ID- SPATN-B-02 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - J. KOHL HARVARD COLLEGE OBS

BRIEF DESCRIPTION
The Ultraviolet Coronal Spectrometer (UVCS) consists of an occulted telescope system and a dual spectrometer with an array detector for observing the 1176- to 1260-A range and two channel electron multipliers for simultaneous observations in O VI 1032-A and 1037-A lines. The field of view encompasses heliocentric distances of 1.5 to 3.5 solar radii. Stray light suppression is sufficient to permit UV observations of this region in the absence of a natural solar eclipse. The Spartan carrier is designed to support 40 hours of observations.

------- SPARTAN-B, MUNRO---

INVESTIGATION NAME- WHITE LIGHT CORONAGRAPH

NSSDC ID- SPATN-B-01 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - R. MUNRO HIGH ALTITUDE OBS

BRIEF DESCRIPTION
The White Light Coronagraph (WLC) is an externally occulted coronagraph which uses a rotating half-wave plate to measure the intensity and polarization of coronal radiation from 4400 to 5400 A. It utilizes a CCD detector system for increased signal-to-noise, greater dynamic range, and shortened exposure time. The WLC is designed to observe the corona from 1.5 to 6 solar radii. The external occulting disk compensates for the steep intensity gradient from the corona to the solar disk. (The intensity contrast is about 1E9.) The distance between pixel centers on the CCD camera is 25 arc-s. From WLC observations, the electron density and three-dimensional geometry of the corona can be specified. From the combined measurements of the WLC and the Ultraviolet Coronal Spectrometer (UVCS) on Spartan-B, the outflow velocity of the solar wind can be specified.

*************************** SPARTAN-C ***************************

SPACECRAFT COMMON NAME- SPARTAN-C
ALTERNATE NAMES- SPARTAN 3

NSSDC ID- SPATN-C

LAUNCH DATE- 12/00/86 WEIGHT- 1100. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 90.3 MIN INCLINATION- 28.5 DEG
PERIAPSIS- 296. KM ALT APOAPSIS- 296. KM ALT

PERSONNEL
MM - J. WOLFF NASA-GSFC
MS - G. CARRUTHERS US NAVAL RESEARCH LAB
MG - J. GLAAB NASA HEADQUARTERS
SC - E. WEILER NASA HEADQUARTERS
PS - W. NEUPERT NASA-GSFC

BRIEF DESCRIPTION
Spartan consists of low-cost, Shuttle-launched, short-duration, sounding-rocket-type payloads. The payloads are retrievable and reusable with a turnaround time of approximately 6 to 9 months. Spartan has relatively few operational interfaces with STS. It operates as an autonomous sub-satellite, and the data are stored on an internal tape recorder. Pointing and stabilization are achieved by an Attitude Control System (ACS). Spartan-C carries a Schmidt electrographic camera which has been successfully flown in four previous sounding rocket investigations. Scientific objectives include a survey of selected star fields and far-UV images of diffuse nebulae and nearby galaxies. Spartan-C is designed to measure the brightness and map the positions of early-type stars, white dwarfs, and hot subdwarfs.

------- SPARTAN-C, CARRUTHERS-------------------------------------

INVESTIGATION NAME- FAR-UV WIDE-FIELD CAMERA

NSSDC ID- SPATN-C-01 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
HIGH ENERGY ASTROPHYSICS
ASTRONOMY

PERSONNEL
PI - G.R. CARRUTHERS US NAVAL RESEARCH LAB

BRIEF DESCRIPTION
This experiment consists of a wide-field electrographic Schmidt camera, which has flown on four previous sounding rocket flights. The camera has an 11-deg field of view, which makes it especially suited to studies of extended objects. The observations by this camera support Hubble Space Telescope operations by providing far-UV photometry of calibration stars and establishing faint photometric sequences in various regions of the sky. The instrument detects stars as faint as 15th magnitude at 1400 A. The wavelength range is 1230-1600 A. The diffuse source sensitivity is such that a density above background of 0.1 on the processed film, in a 20-min exposure time, is produced by a diffuse flux of 4000 photons/(sq cm-s-A-sr) (0.05 rayleighs/A) at 1400 A.

*************************** SPOT-A ***************************

SPACECRAFT COMMON NAME- SPOT-A
ALTERNATE NAMES- SPOT 1

NSSDC ID- SPOT

LAUNCH DATE- 09/00/85 WEIGHT- 1750. KG
LAUNCH SITE- KOUROU (CENTRE SPATIAL GUYANAIS), FRENCH GUIANA
LAUNCH VEHICLE- ARIANE

SPONSORING COUNTRY/AGENCY
FRANCE CNES

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 101.4 MIN INCLINATION- 98.7 DEG
PERIAPSIS- 815. KM ALT APOAPSIS- 829.6 KM ALT

PERSONNEL
PM - P. COURTOIS CNES

BRIEF DESCRIPTION
The SPOT-A (Systeme Probatoire d'Observation de la Terre) spacecraft is an earth observation satellite with a ground resolution better than that of the Landsat series satellites. The main applications for the images returned by the first SPOT mission are land-use studies, agriculture and forestry resources, mineral and oil resources, and cartography. The three-axis stabilized satellite operates in a circular sun-synchronous near-polar orbit for a design lifetime of 2 years. The spacecraft dimensions are 2 x 2 x 3.5 m and 15.60 m for the overall length of the deployed solar panel. SPOT-A consists of two parts: (1) the bus, a standard multipurpose platform, and (2) the payload. The bus provides housekeeping information and an onboard computer. The payload is mounted on one of the side panels of the bus. It consists of two identical high-resolution visible (HRV) imaging instruments and a package comprising two magnetic-tape data recorders and a telemetry transmitter. The HRV imaging instrument observes in three spectral bands (in the visible and near infrared regions) with a ground resolution of 20 m, and/or in a broader spectral band (panchromatic black and white) with a ground resolution of 10 m. The pattern of successive ground tracks is repeated exactly at 26-day intervals. The SPOT-A instrument package has the provision for off-nadir viewing which should be particularly useful for monitoring localized phenomena evolving on a relatively short timescale. It also provides the capability for recording stereoscopic pairs of images of a given area during successive satellite passes.

------- SPOT-A, CRIS STAFF---

INVESTIGATION NAME- HIGH RESOLUTION VISIBLE IMAGER

NSSDC ID- SPOT -01 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL
PI - CRIS STAFF CNES

BRIEF DESCRIPTION
The SPOT-A High Resolution Visible (HRV) imager provides acquisition of high-resolution data of the earth's surface on a global basis. It consists of two identical high-resolution visible (HRV) imaging instruments and a package comprising two magnetic-tape data recorders and a telemetry transmitter. The HRV experiment is designed to operate in either or both of two modes, in the visible and near infrared spectral regions: (1) a panchromatic (black and white) mode corresponding to observation over a broad spectral band (0.51 0.73 micrometer) and (2) a multispectral (color) mode corresponding to observation in three narrower spectral bands (0.50 - 0.59, 0.61 0.68, and 0.79 - 0.89 micrometer). The instrument's sampling mesh corresponds to a ground element (pixel) that is 10 m x 10 m in the first case and 20 m x 20 m in the second, for nadir viewing. The two detectors are of the CCD (charge-coupled device) type. Each array consists of 6000 detectors without any mechanical scanning. Light from the scene being viewed enters the HRV instrument via a plane mirror that is steerable by ground control. The viewing axis can thus be oriented as required in the plane perpendicular to the orbit. This

off-nadir viewing capability covers a range of plus or minus 27 deg relative to the vertical (in 45 steps of 0.6 deg each). This allows the instrument to image any point within a strip extending 475 km to either side of the satellite ground track. The width of the swath actually observed varies between 60 km for nadir viewing and 80 km for extreme off-nadir viewing. With this special feature of off-nadir viewing, the two HRV instruments can be pointed to cover adjacent fields in order to obtain complete earth coverage. Among other possibilities introduced by this feature are increased revisit coverage at intervals ranging from one to several days and the recording of stereoscopic pairs of images of a given area during successive satellite passes. The observation sequence is loaded every day into the onboard computer by the Toulouse ground-control station while the satellite is within its range. The operation sequences for the two HRV instruments are entirely independent. Data will be processed at the Centre de Rectification des Images Spatiales (CRIS) which will be jointly set up by the Centre National d'Etudes Spatiales (CNES) and the Institut Geographique National (IGN). CRIS is responsible for archiving SPOT-A raw data received at Toulouse and for carrying out image data processing.

*************************** SPOT-B ***************************

SPACECRAFT COMMON NAME- SPOT-B
ALTERNATE NAMES- SPOT 2

NSSDC ID- SPOT-2

LAUNCH DATE- 12/00/87 WEIGHT- 1750. KG
LAUNCH SITE- KOUROU (CENTRE SPATIAL GUYANAIS), FRENCH GUIANA
LAUNCH VEHICLE- ARIANE

SPONSORING COUNTRY/AGENCY
FRANCE CNES

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 101.3 MIN INCLINATION- 98.7 DEG
PERIAPSIS- 815. KM ALT APOAPSIS- 829. KM ALT

PERSONNEL
PM - P. COURTOIS CNES

BRIEF DESCRIPTION
The SPOT-B (Systeme Probatoire d'Observation de la Terre) spacecraft is an earth observation satellite with a ground resolution better than that of the Landsat series satellites. The main applications for the images returned by the second SPOT mission are land-use studies, agriculture and forestry resources, mineral and oil resources, and cartography. The three-axis stabilized satellite operates in a circular sun-synchronous near-polar orbit for a design lifetime of 2 years. The spacecraft dimensions are 2 x 2 x 3.5 m and 15.60 m for the overall length of the deployed solar panel. SPOT-B consists of two parts: (1) the bus, a standard multipurpose platform, and (2) the payload. The bus provides housekeeping information and an onboard computer. The payload is mounted on one of the side panels of the bus. It consists of two identical high-resolution visible (HRV) imaging instruments and a package comprising two magnetic-tape data recorders and a telemetry transmitter. The HRV imaging instrument observes in three spectral bands (in the visible and near infrared regions) with a ground resolution of 20 m, and/or in a broader spectral band (panchromatic black and white) with a ground resolution of 10 m. The pattern of successive ground tracks is repeated exactly at 26-day intervals. The SPOT-B instrument package has the provision for off-nadir viewing which should be particularly useful for monitoring localized phenomena evolving on a relatively short timescale. It also provides the capability for recording stereoscopic pairs of images of a given area during successive satellite passes.

------- SPOT-B, CRIS STAFF ---------------------------------------

INVESTIGATION NAME- HIGH RESOLUTION VISIBLE IMAGER

NSSDC ID- SPOT-2 -01 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL
PI - CRIS STAFF CNES

BRIEF DESCRIPTION
The SPOT-B High Resolution Visible (HRV) imager provides acquisition of high-resolution data of the earth's surface on a global basis. It consists of two identical high-resolution visible (HRV) imaging instruments and a package comprising two magnetic-tape data recorders and a telemetry transmitter. The HRV experiment is designed to operate in either or both of two modes, in the visible and near infrared spectral regions: (1) a panchromatic (black and white) mode corresponding to observation over a broad spectral band (0.51 0.73 micrometer) and (2) a multispectral (color) mode corresponding to observation in three narrower spectral bands (0.50 - 0.59, 0.61 - 0.68, and 0.79 - 0.89 micrometer). The instrument's sampling mesh corresponds to a ground element (pixel) that is 10 m x 10 m in the first case and 20 m x 20 m in the second, for nadir viewing. The two detectors are of the CCD (charge-coupled device) type. Each array consists of 6000 detectors without any mechanical scanning. Light from the scene being viewed enters the HRV instrument via a plane mirror that is steerable by ground control. The viewing axis can thus be oriented as required in the plane perpendicular to the orbit. This off-nadir viewing capability covers a range of plus or minus 27 deg relative to the vertical (in 45 steps of 0.6 deg each). This allows the instrument to image any point within a strip extending 475 km to either side of the satellite ground track. The width of the swath actually observed varies between 60 km for nadir viewing and 80 km for extreme off-nadir viewing. With this special feature of off-nadir viewing, the two HRV instruments can be pointed to cover adjacent fields in order to obtain complete earth coverage. Among other possibilities introduced by this feature are increased revisit coverage at intervals ranging from one to several days and the recording of stereoscopic pairs of images of a given area during successive satellite passes. The observation sequence is loaded every day into the onboard computer by the Toulouse ground-control station while the satellite is within its range. The operation sequences for the two HRV instruments are entirely independent. Data will be processed at the Centre de Rectification des Images Spatiales (CRIS) which will be jointly set up by the Centre National d'Etudes Spatiales (CNES) and the Institut Geographique National (IGN) CRIS is responsible for archiving SPOT-B raw data received at Toulouse and for carrying out image data processing.

*************************** SUNLB-A ***************************

SPACECRAFT COMMON NAME- SUNLB-A
ALTERNATE NAMES-

NSSDC ID- SUNLB-A

LAUNCH DATE- 07/00/86 WEIGHT- KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 90.3 MIN INCLINATION- 28.5 DEG
PERIAPSIS- 296. KM ALT APOAPSIS- 296. KM ALT

PERSONNEL

MM - R.	LESTER	NASA-MSFC
MS - R.	MOORE	NASA-MSFC
SC - E.	WEILER	NASA HEADQUARTERS
PM - L.	DEMAS	NASA HEADQUARTERS

BRIEF DESCRIPTION
SUNLAB-A is a Shuttle-attached payload which is a reflight of the four solar physics instruments designed to be flown aboard SPACELAB 2. It consists of the igloo, forward pallet, instrument pointing system, and four solar telescopes. SUNLAB-A is designed to allowed more observing time than the 25 h allowed for on SPACELAB 2.

------- SUNLB-A, BRUECKNER ---------------------------------------

INVESTIGATION NAME- HIGH RESOLUTION TELESCOPE
AND SPECTROGRAPH (HRTS)

NSSDC ID- SUNLB-A-03 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - G.E.	BRUECKNER	US NAVAL RESEARCH LAB
OI - J.D.F.	BARTOE	US NAVAL RESEARCH LAB
OI - O.K.	MOE	U OF OSLO
OI - K.R.	NICOLAS	US NAVAL RESEARCH LAB
OI - M.E.	VAN HOOSIER	US NAVAL RESEARCH LAB
OI - C.	JORDAN	OXFORD U

BRIEF DESCRIPTION
The objectives of this investigation are (1) the study of the energy transport and mass balance of the temperature minimum, chromosphere, transition zone, and corona in the quiet sun as well as in plages, flares, and sunspots; (2) the examination of the velocity field of the lower corona to study the origin of the solar wind; (3) the study of the structure and dynamics of spicules and superspicules in the UV spectrum; (4) the study of structure and dynamics of prominences; and (5) the study of pre-flare and flare phenomena. These objectives are obtained through intensity measurements, Doppler measurements, and line-profile analysis of high spatial resolution (1 arc-s) and high spectral resolution (5 pm) of UV spectra (wavelengths 117.6-170 nm) covering a wide variety of continua and emission lines that originate in different temperature regimes of the solar atmosphere. The instrumentation consists of a stigmatic spectrograph with a slit that covers the full solar radius simultaneously with 1000 resolution elements. Thus, the slit covers many different solar features at the same time. One spectrum contains enough information for a statistical analysis. Photographs of a series of spectra over a period of at least 15 min are made in order to follow the changes in the intensity, Doppler

velocities, and line profiles as they are caused by disturbances moving through the solar atmosphere. Spectroheliograms of two dimensions as a function of time are constructed in order to investigate the three-dimensional structure of the chromosphere and transition zone. A systematic mapping of the coronal velocity field over the whole sun is also made, along with a series of limb spectra at different altitudes for studies of the structure and dynamics of spicules. The slit is pointed within a tolerance of half a slit width for a duration of at least 15 min. The slit of the high-resolution telescope and spectrograph (HRTS) is stepped in rapid sequence over a small area of the sun (plus or minus 5 arc-s), which allows the spectroheliograms to be made. The HRTS consists of a 30-cm Gregorian telescope of 90-cm focal length, a UV spectrograph, a 160-nm broad-band spectroheliograph, and an H-alpha split-display system housed in a thermal control canister mounted on the instrument pointing system (IPS). The telescope has an occulting mirror at the primary focus that reflects away all but a 5 x 15 arc-min portion of the solar image that then passes through an aperture to strike a secondary mirror that re-images it onto the UV Wadsworth spectrographic slit plate. The secondary mirror receives less than one solar constant of illumination. The spectral resolution is 50 mA, and the spatial resolution is 1 arc-s. The roll film camera holds 1000 exposures of type-101 film.

------- SUNLB-A, BRUECKNER--------------------------------------

INVESTIGATION NAME- SOLAR UV SPECTRAL IRRADIANCE MONITOR (SUSIM)

NSSDC ID- SUNLB-A-04

INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - G.E.	BRUECKNER	US NAVAL RESEARCH LAB
OI - J.D.F.	BARTOE	US NAVAL RESEARCH LAB
OI - D.K.	PRINZ	US NAVAL RESEARCH LAB
OI - M.E.	VAN HOOSIER	US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

The objectives of this investigation are (1) to improve the accuracy of knowledge of the absolute solar fluxes; (2) to provide a highly accurate traceability of solar fluxes to a variety of UV radiation standards to establish long-term (solar cycle) variations; and (3) to measure the variability of solar fluxes in the wavelength range of 120-400 nm during several time periods, ranging from flare-produced changes to the variability from solar rotation. It is desired to (a) improve the absolute accuracy of solar continuum irradiance measurements in this wavelength range with a goal of plus or minus 6 to 10% (wavelength-dependent), (b) measure with high accuracy the intensities of the continuum below 208 nm relative to the intensities of the continuum above 208 nm with a goal of plus or minus 1%, (c) perform high-accuracy measurements of the intensities of solar emission lines relative to the stable solar continuum above 208 nm with a goal of plus or minus 1 to 5% (wavelength-dependent), and (d) improve the absolute accuracy of solar emission line irradiance measurements in the 120- to 400-nm region with a goal of plus or minus 6 to 10% (wavelength-dependent). The instrumentation consists of a solar UV spectral irradiance monitor. The monitor consists of two identical double-dispersion scanning spectrometers, seven detectors (five photodiodes and two photon counters), and a UV calibration light source. They are sealed in a canister filled with 1.1 atm of argon to eliminate the effects of contamination from high vacuum outgassing. One spectrometer is used almost continuously during the daylight portion of the solar-pointed orbit for measuring short-time variations of the UV solar flux (flare-related and slowly varying component). The other spectrometer is used only once a day to track any change in sensitivity of the first spectrometer. Two of the five photodiodes are used only once a day. A deuterium lamp calibrated in spectral irradiance is used as the transfer standard source for daily inflight calibration and stability tracking of both spectrometers and all seven detectors. The two photon counters obtain a spectral resolution of 0.1 nm over the whole wavelength range, while 5-nm resolution is obtained with the five photodiodes. A microprocessor controls all instrument functions by program instruction. Channels monitor the 121.6-nm line (Lyman alpha) and seven segments of the continuum from 145 to 390 nm. Eight narrow-band channels (0.1-nm resolution) are monitored continuously and scanned in five 0.1-nm steps. In the spectral scan mor

------- SUNLB-A, GABRIEL--------------------------------------

INVESTIGATION NAME- SOLAR CORONAL HELIUM ABUNDANCE

NSSDC ID- SUNLB-A-02

INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - A.H.	GABRIEL	RUTHERFORD APPLETON L.
PI - J.L.	CULHANE	U COLLEGE LONDON
OI - B.E.	PATCHETT	RUTHERFORD APPLETON L.
OI - K.	NORMAN	MULLARD SPACE SCI LAB
OI - J.H.	PARKINSON	U COLLEGE LONDON
OI - J.	LANG	RUTHERFORD APPLETON L.
OI - K.J.H.	PHILLIPS	RUTHERFORD APPLETON L.
OI - P.	BORRILL	MULLARD SPACE SCI LAB

BRIEF DESCRIPTION

The objectives of this investigation are (1) to determine the relative abundance of helium to hydrogen in the solar corona from the measurement of the photoexcitation of hydrogen Lyman alpha at 121.6 nm and helium II at 30.4 nm; (2) to determine the fundamental parameters of the coronal plasma such as electron density, temperature, and ionization balance as a function of radial distance above the limb; and (3) to construct a contour map in the intensity of selected extreme UV lines and in physical parameters (electron temperature and density) of coronal features with 15-arc-s resolution, both on the disk and above the limb of the sun. The instrumentation is composed of a 1-m, grazing-incidence spectrometer using a 1200-line/mm ruled grating. The sun's image is focused onto the entrance slit plane by means of a 28-cm focal length, grazing-incidence telescope of Wolter type-1 sector design. The slit is oriented tangentially to the solar limb, and can be stepped radially in steps of 1 arc-min from a position on the solar disk to 8 arc-min above the limb by a servo-driven linear traverse on the telescope mirror. Twelve channel electron multipliers are positioned behind different exit slits at pre-selected spectral positions on the Rowland circle. Two positions are at 121.6 nm and 30.4 nm (for H/He abundances). The other slits cover associated parameters, such as the temperature and density of the solar atmosphere. Some slits have attenuating filters for dynamic range of the ratio of the disk intensity to that of the corona at the distance of 3.5E5 km. Filters are removed for limb measurements. A small oscillatory rotation of the grating about an axis through the entrance slit permits a small wavelength scan to discriminate against scattered stray light. An auxiliary instrument monitors changes in He II 30.4 nm intensity caused by atmospheric absorption effects resulting from spacecraft height or changes of line of sight to the sun. A zero-order detector monitors the solar limb crossings and gives data on short-term intensity variations in stars for wavelengths shorter than 140 nm. Signals are counted, multiplexed, and interfaced with the Sunlab telemetry system for transmission to the ground. The pointing accuracy is 15 arc-s and the pointing stability is 5 arc-s.

------- SUNLB-A, TITLE--------------------------------------

INVESTIGATION NAME- SOLAR MAGNETIC AND VELOCITY FIELD MEASUREMENT SYSTEM

NSSDC ID- SUNLB-A-01

INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL

PI - A.M.	TITLE	LOCKHEED PALO ALTO
OI - H.E.	RAMSEY	LOCKHEED PALO ALTO
OI - S.A.	SCHOOLMAN	LOCKHEED PALO ALTO
OI - T.D.	TARBELL	LOCKHEED PALO ALTO
OI - L.W.	ACTON	LOCKHEED PALO ALTO
OI - W.L.	LIVINGSTON	KITT PEAK NATL OBS
OI - J.W.	HARVEY	KITT PEAK NATL OBS
OI - R.W.	MILKEY	KITT PEAK NATL OBS
OI - G.W.	SIMON	USAF GEOPHYS LAB
OI - S.P.	WORDEN	USAF GEOPHYS LAB
OI - J.B.	ZIRKER	USAF GEOPHYS LAB

BRIEF DESCRIPTION

The objectives of this investigation are (1) to measure magnetic and velocity fields in the solar atmosphere with high spatial resolution and deduce the small-scale structure and evolution of these fields on the 10- to 20-min time scale of solar granulation; (2) to follow the evolution of solar magnetic structures over periods of 20 to 40 h in order to determine how the magnetic elements couple to the supergranule velocity patterns and by what mechanisms field diffusion and disappearance occur; (3) to study with high temporal and spatial resolution the magnetic field changes associated with transient events such as flares, and to isolate and follow the birth of sunspots, pores, and ephemeral regions; (4) to develop the elements of an H-alpha magnetograph/telescope that can be reflown; and (5) to provide a test of the pointing accuracy and stability of the instrument pointing system (IPS) to subarc-second accuracy. The instrumentation consists of a solar optical universal polarimeter mounted on the IPS. The polarimeter is composed of a tunable birefringent filter with a bandpass of 60 mA using associated blocking filters to permit the filter to operate in eight spectral bands, each about 0.8 nm wide. A film camera takes direct filtergrams through the tunable filter. A charge injection device (CID)-array camera takes photoelectric filtergrams with a high signal-to-noise ratio through the tunable filters. A video processor stores images in digital memory and a high-resolution, white-light system with film camera and video display is used for

acquisition of accurate pointing data. The filter systems are interfaced to a 30-cm Cassegrain telescope with offset pointing capability. Rotatable wedges are placed in front of the telescope to allow it to observe any desired point on the sun. A guider assembly compensates for high-speed image motion. To record a complete line profile, filtergrams are taken in orthogonal polarizations at 15 wavelengths spaced 2 to 3.5 pm apart and in the near continuum. They are recorded on SO115 film with a resolution element of 50 micrometers per side.

************************** TOPEX******************************

SPACECRAFT COMMON NAME- TOPEX
ALTERNATE NAMES- OCEAN TOPOGRAPHY EXPER.

NSSDC ID- TOPEX

LAUNCH DATE- 00/00/90 WEIGHT- KG
LAUNCH SITE-
LAUNCH VEHICLE- ARIANE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA
FRANCE CNES

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 120. MIN INCLINATION- 63.4 DEG
PERIAPSIS- 1334. KM ALT APOAPSIS- 1334. KM ALT

PERSONNEL
PM - C.A. YAMARONE NASA-JPL
PS - R.H. STEWART NASA-JPL

BRIEF DESCRIPTION
The Ocean Topography Experiment (TOPEX) satellite is part of a project planned to coincide with the World Ocean Circulation Experiment to be conducted at the end of the decade. The satellite is designed to collect altimetry data for determining precise global sea-surface elevations. The spacecraft carries a NASA payload as well as a French CNES payload. The NASA payload consists of two primary instruments: a dual-frequency altimeter and a three-channel, non-scanning microwave radiometer. Other NASA instruments include laser retroreflectors, a Doppler beacon, and an experimental GPS receiver. The CNES payload consists of a radar altimeter and a high-precision Doppler tracking system (DORIS). The spacecraft orbit is designed to cover the same ground track approximately every 10 days. Lifetime of the satellite is expected to be 3 to 5 years.

------- TOPEX, UNKNOWN---

INVESTIGATION NAME- DUAL-FREQUENCY ALTIMETER

NSSDC ID- TOPEX -01 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
OCEANOGRAPHY
NAVIGATION
GEODESY

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
The TOPEX dual-frequency altimeter measures the satellite-to-sea surface range, wave height, and wind speed directly beneath the spacecraft. The primary measurement frequency is 13.7 GHz (Ku-Band), and the second frequency is 5.3 GHz (C-Band). The subsequent range difference measured at these two frequencies provides a first-order correction for the influence of the ionosphere. The instrument is an upgraded version of the type of altimeter that was flown on the GEOS 3 geodetic satellite and the SEASAT oceanographic satellite. Measurement precision is between 1 and 2 cm. Sharing its antenna with the CNES radar altimeter, the NASA experiment will be operating 95% of the time, with the CNES experiment operating approximately 5% of the time.

------- TOPEX, UNKNOWN---

INVESTIGATION NAME- MICROWAVE RADIOMETER

NSSDC ID- TOPEX -02 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
OCEANOGRAPHY
METEOROLOGY

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
The non-scanning microwave radiometer on TOPEX measures radiation emitted from water vapor between the satellite and the ocean. The instrument has three channels, each operating at one of the following frequencies: 18, 31, and 37 GHz. Measurement can provide corrections to altimeter height data for the effects of atmospheric water vapor.

------- TOPEX, UNKNOWN---

INVESTIGATION NAME- LASER RETROREFLECTORS

NSSDC ID- TOPEX -03 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION
GEODESY

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
The TOPEX array of laser retroreflectors allows independent height measurement to be made from island calibration sites to verify and calibrate the altimeter height measurements.

------- TOPEX, UNKNOWN---

INVESTIGATION NAME- DOPPLER BEACON

NSSDC ID- TOPEX -04 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
The two-frequency Doppler beacon on TOPEX is to be used with the Defense Mapping Agency's Tranet Tracking System. The beacon is the prime instrument for precise orbit determination.

------- TOPEX, UNKNOWN---

INVESTIGATION NAME- GLOBAL POSITIONING SYSTEM (GPS) RECEIVER

NSSDC ID- TOPEX -05 INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
The Global Positioning System (GPS) receiver on the TOPEX is an experimental system which extracts pseudo range (range plus a clock bias) from the transmission of the GPS satellites. By using double-differenced range measurements from the anticipated 18-satellite operational GPS constellation and 7 or 8 ground stations, the global orbits for TOPEX can be determined to subdecimeter accuracy.

------- TOPEX, UNKNOWN---

INVESTIGATION NAME- HIGH-PRECISION DOPPLER TRACKING SYSTEM, DORIS

NSSDC ID- TOPEX -06 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
The high-precision Doppler tracking system (DORIS) to be carried on TOPEX is designed and built by the French CNES to enable Doppler-based precision orbit determination by CNES.

------- TOPEX, UNKNOWN---

INVESTIGATION NAME- CNES RADAR ALTIMETER

NSSDC ID- TOPEX -07 INVESTIGATIVE PROGRAM
CODE EE/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
OCEANOGRAPHY
NAVIGATION
GEODESY

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
The CNES radar altimeter on TOPEX is a single-channel (Ku-Band) instrument used to measure sea surface height. The CNES altimeter will share the NASA altimeter antenna by operating approximately 5% of the time with the NASA altimeter operating 95% of the time.

**************************** TSS ****************************

SPACECRAFT COMMON NAME- TSS
ALTERNATE NAMES- TETHERED SATELLITE SYSTM

NSSDC ID- TSS

LAUNCH DATE- 12/00/87 WEIGHT- KG
LAUNCH SITE-
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY

UNITED STATES	NASA-OSSA
ITALY	PSN/CNR

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 90.3 MIN INCLINATION- 28.5 DEG
PERIAPSIS- 296. KM ALT APOAPSIS- 296. KM ALT

PERSONNEL

MG - M.B. NOLAN	NASA HEADQUARTERS
SC - R.D. HUDSON	NASA HEADQUARTERS
PM - J.M. SISSON	NASA-MSFC
PS - N.H. STONE	NASA-MSFC

BRIEF DESCRIPTION

The Tethered Satellite System (TSS), the "satellite on a string," is a joint U. S./Italian project. Carried into orbit by the Space Shuttle, TSS deploys experiments in space at distances of up to approximately 100 km from the Shuttle Orbiter. Science instruments remain tethered either upward or downward from the satellite for about 16 hours at a time before being "reeled" back in. Limited science operations may be carried out during the deployment and retrieval periods. On the first flight of TSS, the satellite is deployed upward on a conducting tether to a distance of 20 km from the Shuttle. The objectives of the first flight (presently the only one funded) are to verify the controlled deployment, the operation and retrieval of the tethered satellite, and to carry out scientific investigations in the general areas of tether dynamics, studies of spacecraft environment, and space plasma physics. Second and third flights are planned to take place at 18-month intervals after the first. For these later flights, investigations in the fields of atmospheric, ionospheric, and space plasma physics and geodynamics will be emphasized. The investigation selection announcement for all three flights will be made soon. The TSS is comprised of two major elements, the Deployer to be supplied by NASA, and the Satellite to be supplied by PSN/CNR. The Deployer consists of a Spacelab pallet, a support structure and deployment mechanism, an extendible/retractable boom for initial deployment and final retrieval of the Satellite, an electrical power and distribution subsystem, and a tether and tether control capability. An electron gun, capable of drawing a current of up to 1 A along the conducting tether, is mounted on the Deployer for the use of the investigators. Up to 100 kg of science experiments can be mounted on the Deployer. The Satellite is spherical with a diameter of 1.5 m. The upper hemisphere houses the scientific payload, while the lower hemisphere contains the support equipment. The spacecraft is equipped with cold gas (nitrogen) thrusters to be used for deployment, retrieval, and for attitude control in pitch, roll, and yaw during station keeping. A 1-m fixed equatorial boom will be provided to carry instruments. Two investigator-supplied booms for electric field measurements can be accommodated also. A three-axis accelerometer is mounted in the Satellite. The spacecraft telemetry will provide 64 input/output channels for analog, discrete and digital data. The maximum bit rate during station keeping is 12 kbs, while 6 kbs will be available during deployment and retrieval. It is expected that an average power of approximately 50 W (28V dc) will be allocated to the investigations with a total capacity of 1900 W-h. The payload mass for an upward deployed science mission is about 66 kg; for a downward deployed science mission it is 46 kg.

**************************** UARS ****************************

SPACECRAFT COMMON NAME- UARS
ALTERNATE NAMES- UPPER ATMOSPH.RESEAR.SAT

NSSDC ID- UARS-1

LAUNCH DATE- 10/00/89 WEIGHT- 5455. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY

UNITED STATES	NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 97. MIN INCLINATION- 57. DEG
PERIAPSIS- 600. KM ALT APOAPSIS- 600. KM ALT

PERSONNEL

MG - D.B. BROOME	NASA HEADQUARTERS
SC - R.J. MCNEAL	NASA HEADQUARTERS
PM - P.T. BURR	NASA-GSFC
PS - C.A. REBER	NASA-GSFC

BRIEF DESCRIPTION

The Upper-Atmosphere Research Satellite (UARS) will be launched as part of the upper-atmosphere research program. The basic objectives of the UARS mission are to conduct research in the atmosphere above the tropopause by measuring the global budget of constituent trace gases and their chemical, dynamical, and radiative behavior. Specifically, the objectives are (1) to study energy input and loss in the upper atmosphere; (2) to study global atmospheric photochemistry; (3) to study dynamics of the upper atmosphere; and (4) to study the coupling among processes and between atmospheric regions. The UARS has two major components. The first is the Multimission Modular Spacecraft (MMS), designed as a standard bus for NASA spacecraft missions (e.g., SMM and Landsat-D), and consisting of three basic modules: attitude control subsystem; power subsystem; and communications and data handling subsystem. The second major component is an instrument module which provides mounting accommodations for the scientific instruments. The MMS maintains a precise orientation to the local vertical and to the velocity vector. There are two onboard tape recorders. Three NASA standard 50-A-h nickel-cadmium batteries will fly along with the solar cell array. The planned lifetime for the mission is 18 months, limited by the finite amount of stored cryogen needed for one of the instruments. The data are returned to earth through the TDRSS. A central dat processing and storage facility at NASA-GSFC, linked to remote analysis and display computers at the investigators' institutions, facilitates the timely processing and analysis of the data. In addition to the investigators who are providing instruments, the UARS Science Team includes 10 theoretical investigator groups.

------- UARS, BRUECKNER -------

INVESTIGATION NAME- SOLAR ULTRAVIOLET SPECTRAL IRRADIANCE MONITOR 120-400 NM

NSSDC ID- UARS-1 -08

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
SOLAR PHYSICS

PERSONNEL

PI - G.E. BRUECKNER	US NAVAL RESEARCH LAB
OI - M.E. VAN HOOSIER	US NAVAL RESEARCH LAB
OI - D.K. PRINZ	US NAVAL RESEARCH LAB
OI - J.D.F.BARTOE	US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

The main objective of this investigation is to improve the existing accuracy of solar flux measurements in the 120 - to 400-nm region of the spectrum, and to help determine the variations of this flux over a solar cycle. The full-sun spectral irradiance is measured with two spectral resolutions, 0.15 and 5 nm, with an absolute accuracy of plus or minus 6 to 10% (wavelength dependent). The accuracy of the measurements below 210 nm relative to measurements of the more stable solar continuum above 210 nm is plus or minus 1 to 5% (wavelength dependent). The solar ultraviolet spectral irradiance monitor (SUSIM) consists of two identical double-dispersion scanning spectrometers, seven detectors, and three deuterium calibration lamps. The spectrometers and detectors are sealed in a canister filled with 1.1 atm of argon gas. One spectrometer is used almost continuously; the second is used infrequently to track the stability of the first. The deuterium lamps serve as secondary standards for inflight calibration.

------- UARS, CHANG -------

INVESTIGATION NAME- THEORETICAL ANALYSIS-CHEMICAL,RADIATIVE, AND DYNAMICAL PROCESSES-MIDDLE ATMOSPHERE

NSSDC ID- UARS-1 -24

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL

PI - J.S. CHANG	LAWRENCE LIVERMORE LAB
PI - F.M. LUTHER	LAWRENCE LIVERMORE LAB
OI - J.E. PENNER	LAWRENCE LIVERMORE LAB
OI - D.J. WUEBBLES	LAWRENCE LIVERMORE LAB

BRIEF DESCRIPTION

This theoretical investigation studies the mechanisms that control upper atmosphere structure variability, and the response of the upper atmosphere to natural and anthropogenic perturbations. The focus is on the chemical, radiative, and dynamical processes in the middle atmosphere using time-dependent transport-kinetics models.

------- UARS, CUNNOLD---

INVESTIGATION NAME- PREDICTION OF THE DYNAMICAL IMPACT OF CHANGES IN STRATOSPHERIC OZONE

NSSDC ID- UARS-1 -18

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL

PI -	D.M.	CUNNOLD	GEORGIA INST OF TECH
OI -	F.N.	ALYEA	MASS INST OF TECH

BRIEF DESCRIPTION

A principal goal of this modeling activity is to estimate the dynamical response of the atmosphere to chemical perturbations, particularly the nature of transport in the stratosphere. This theoretical investigation uses the UARS data to test and update a three-dimensional photochemical dynamical model of the stratosphere. A 32-level model, extending from the ground to 87 km and containing a horizontal resolution approximately equivalent to planetary wave-number 18, is used in this study. It contains the prediction of between three and six long-lived chemical species.

------- UARS, GELLER---

INVESTIGATION NAME- OBSERV.ANALYSIS-THEORETICAL MODELLING INVESTIGATIONS OF DYNAMICS FOR UARS

NSSDC ID- UARS-1 -20

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
METEOROLOGY
ATMOSPHERIC PHYSICS

PERSONNEL

PI -	M.A.	GELLER	NASA-GSFC
OI -	M.R.	SCHOEBERL	NASA-GSFC
OI -	R.S.	STOLARSKI	NASA-GSFC

BRIEF DESCRIPTION

The major goals of this theoretical investigation are to construct a simulation of upper-atmosphere flow regimes and utilize the UARS observed parameters, to study the resolvability of upper-atmosphere dynamics, by the UARS instruments and subsequent data analysis, and to assess the extent to which upper-atmosphere data must be included in studies of tropospheric climate and in extended-range forecasting.

------- UARS, GROSE---

INVESTIGATION NAME- STRATOSPHERIC TRANSPORT PROCESSES,BUDGET OF MINOR CONSTITUENTS,AND ENERGETICS

NSSDC ID- UARS-1 -22

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL

PI -	W.L.	GROSE	NASA-LARC
OI -	W.T.	BLACKSHEAR	NASA-LARC
OI -	K.V.	HAGGARD	NASA-LARC
OI -	E.E.	REMSBERG	NASA-LARC
OI -	R.E.	TURNER	NASA-LARC
OI -	J.E.	NEALY	NASA-LARC

BRIEF DESCRIPTION

This theoretical investigation is a coordinated program of theoretical model studies, data analysis, and interpretation designed to study transport processes, budgets of trace chemicals, and energetics of the stratosphere. The first part of this effort is devoted to the study of the transport of minor constituents, heat, momentum, and potential vorticity in the stratosphere. The second part utilizes UARS data to study budgets of trace chemicals by determining bulk mass-transfer rates within the stratosphere and among the stratosphere, troposphere, and mesosphere. The last part of this effort is an analysis of stratospheric energetics.

------- UARS, HAYS---

INVESTIGATION NAME- HIGH RESOLUTION DOPPLER IMAGER (HRDI)

NSSDC ID- UARS-1 -02

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL

PI -	P.B.	HAYS	U OF MICHIGAN
OI -	G.	HERNANDEZ	NOAA-ERL
OI -	D.	REES	U COLLEGE LONDON
OI -	R.G.	ROBLE	NATL CTR FOR ATMOS RES

BRIEF DESCRIPTION

The objective of this investigation is to use a high-resolution, Doppler-imaging, Fabry-Perot interferometer to detect sharp features in the spectrum of light emitted or scattered from the earth's atmosphere, and to obtain the vector wind field directly. The information obtained is used to study a series of problems associated with the dynamics of the atmosphere and the transport of minor constituents within the atmosphere. There is a single sensor containing the spectral filters and the main objective telescope. The telescope is gimballed to view the horizon at two orthogonal directions, and to scan in the zenith direction for altitude coverage.

------- UARS, HOLTON---

INVESTIGATION NAME- WAVE DYNAMICS AND TRANSPORT IN THE MIDDLE ATMOSPHERE

NSSDC ID- UARS-1 -17

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
METEOROLOGY
PLANETARY ATMOSPHERES

PERSONNEL

PI -	J.R.	HOLTON	U OF WASHINGTON
OI -	J.M.	WALLACE	U OF WASHINGTON
OI -	D.L.	HARTMANN	U OF WASHINGTON
OI -	R.E.	YOUNG	NASA-ARC
OI -	C.B.	LEOVY	U OF WASHINGTON

BRIEF DESCRIPTION

This theoretical investigation uses a program of observational analysis using UARS data and numerical modeling designed to elucidate the nature of the general circulation of the middle atmosphere, the role of dynamics in controlling the distribution and variability of various trace constituents, and the nature and extent of dynamical interactions between the lower and middle atmosphere. Emphasis is placed on the roles which large-scale wave motions play in maintaining the budgets of momentum, heat, and trace constituent concentrations on a global basis in the middle atmosphere.

------- UARS, LONDON---

INVESTIGATION NAME- RESPONSE OF UPPER ATMOSPHERE PARAMETERS TO VARIATIONS OF SOLAR ACTIVITY

NSSDC ID- UARS-1 -19

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL

PI -	J.	LONDON	U OF COLORADO
OI -	G.E.	THOMAS	U OF COLORADO

BRIEF DESCRIPTION

This theoretical investigation deals with the natural variability of the thermal structure and ozone concentration of the upper atmosphere with emphasis on their response to significant solar variability. It provides definitive tests, from analysis of retrieved data, of specified mechanisms by which ozone variations are in response to variations in solar activity. A two-fold approach is used: data analysis and statistical evaluation of the pertinent upper atmosphere parameters as they relate to various forms of solar activity; and theoretical study of the sensitivity of realistic models of the ozone photochemical equilibrium system as related to observed and suggested solar variability.

------- UARS, MILLER---

INVESTIGATION NAME- SYNOPTIC ANALYSIS+DYNAMICAL INTERPRETA. OF UARS METEOROLOGICAL INFORMATION

NSSDC ID- UARS-1 -16

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
METEOROLOGY
PLANETARY ATMOSPHERES

PERSONNEL

PI -	A.J.	MILLER	NOAA-NMC
PI -	M.E.	GELMAN	NOAA-NMC

BRIEF DESCRIPTION

The objective of this theoretical investigation is to merge temperature and wind measurements in the stratosphere and mesosphere with the Operational National Weather Service analyses. Energy budget terms are evaluated, and height and temperature fields (planetary waves) are analyzed by Fourier analysis. The interlayer dynamic coupling among the troposphere, stratosphere, and mesosphere is studied also.

------- UARS, REBER---

INVESTIGATION NAME- ANALYTIC-EMPIRICAL MODELING OF UPPER ATMOSPHERE PARAMETERS

NSSDC ID- UARS-1 -21 INVESTIGATIVE PROGRAM CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL

PI - C.A.	REBER		NASA-GSFC
OI - F.T.	HUANG		COMPUTER SCIENCES CORP
OI - A.E.	HEDIN		NASA-GSFC
OI - E.	HILSENRATH		NASA-GSFC

BRIEF DESCRIPTION

The primary objectives of this theoretical investigation are the organization, empirical modeling, and geophysical interpretation of the various data acquired from the UARS. A secondary objective is the acquisition of complementary data from other sources (e.g., the operational NOAA satellites) for use in this analysis and for use by the UARS Science Team. A substantial part of the investigation is the calculation of a time-dependent, three-dimensional, analytic-empirical model using data on atmospheric temperature, minor species mixing ratios, etc. The modeling technique is a direct follow-up to the OGO Model and the Mass Spectrometer-Incoherent Scatter (MSIS) Model which have proven quite successful for thermospheric research, and to the current empirical Ozone Model, all of which were developed and are available at the Goddard Space Flight Center, Code 616, Greenbelt, Md. 20771.

------- UARS, ROCHE---

INVESTIGATION NAME- ALTITUDE DISTRIBUTION OF ATMOSPHERIC MINOR SPECIES AND TEMP.IN 10-60KM RANGE

NSSDC ID- UARS-1 -05 INVESTIGATIVE PROGRAM CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.E.	ROCHE	LOCKHEED PALO ALTO
OI - J.B.	KUMER	LOCKHEED PALO ALTO
OI - R.D.	SEARS	LOCKHEED PALO ALTO
OI - T.C.	JAMES	LOCKHEED PALO ALTO
OI - L.R.	MEGILL	UTAH STATE U
OI - K.D.	BAKER	UTAH STATE U
OI - D.G.	MURCRAY	U OF DENVER
OI - A.	GOLDMAN	U OF DENVER
OI - J.C.	GILLE	NATL CTR FOR ATMOS RES

BRIEF DESCRIPTION

The investigation objectives are to remotely measure the stratospheric composition (H2O, N2O, NOx, HNO3, Cl2, ClO, HCl, O3, CO2, and CH4) and temperature in the 10- to 60-km altitude range. The composition and temperature are determined from measurements of limb emission spectra in the 3.5- to 12-micrometer infrared wavelength range. The necessary high sensitivity, background flux discrimination, and spectral resolution are provided by a cryogenically cooled solid-etalon spectrometer using a linear detector array to simultaneously cover the 10- to 60-km range with 2-km resolution. The spectral resolution is 0.25 inverse cm. Three days are required to achieve global coverage within the measured 75-deg latitude region.

------- UARS, ROTTMAN---

INVESTIGATION NAME- ULTRAVIOLET SOLAR SPECTRAL IRRADIANCE EXPERIMENT

NSSDC ID- UARS-1 -04 INVESTIGATIVE PROGRAM CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
SOLAR PHYSICS

PERSONNEL

PI - G.J.	ROTTMAN	U OF COLORADO
OI - J.	LONDON	U OF COLORADO

BRIEF DESCRIPTION

The objective of this investigation is to measure the solar spectrum at wavelengths between 120 and 500 nm with an absolute accuracy better than 10%. Temporal variations of the solar radiation are followed to within 1 to 2% during these missions. The investigation utilizes a 1/8-m Ebert-Fastie spectrometer with approximately 0.15-nm spectral resolution. It has three separate data channels, each using a phototube optimized for different, but overlapping, portions of the instrument spectral range. Solar data are taken on a daily basis and analyzed to establish correlations of the spectral irradiance with solar rotation and with solar activity (10.7-cm flux levels, sunspot number, calcium plage area, solar flares, etc.). The normal mode of operation involves a 4-h duty cycle per day. Of this total time, 1 h is spent observing the sun and the remainder of the time is spent in calibration activities. Ten to 15 stars are chosen for the calibration program.

------- UARS, RUSSELL, 3RD---

INVESTIGATION NAME- HALOGEN OCCULTATION EXPERIMENT (HALOE)

NSSDC ID- UARS-1 -09 INVESTIGATIVE PROGRAM CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
METEOROLOGY
PLANETARY ATMOSPHERES

PERSONNEL

PI - J.M.	RUSSELL, 3RD	NASA-LARC
OI - J.	PARK	COLL OF WILLIAM + MARY
OI - S.R.	DRAYSON	U OF MICHIGAN
OI - P.J.	CRUTZEN	MPI-CHEMISTRY
OI - R.J.	CICERONE	NATL CTR FOR ATMOS RES
OI - P.L.	HANST	ENVIRON PROTECT AGENCY
OI - J.E.	FREDERICK	NASA-GSFC
OI - J.E.	HARRIES	RUTHERFORD APPLETON L.
OI - A.F.	TUCK	METEOROLOGICAL OFFICE

BRIEF DESCRIPTION

The objective of this investigation is to measure, using solar occultation techniques, the upper-atmospheric vertical concentration profiles of H2O, O3, HCl, HF, NO, CH4, HNO3, and CO2. Pressure in the altitude range from 10 to 55 km is measured also. The measurements are used to study trace gas sources and sinks and upper-atmosphere transport, and to validate photochemical and atmospheric dynamics models. A four-channel gas-filter correlation radiometer and a five-channel filter radiometer mounted on a common chassis with azimuth and elevation scan capability are used. The gas filter correlation radiometry is used to measure HCl, HF, CH4, NO, and CO2, and broadband filter spectroscopy is used to measure H2O, O3, HNO3, and CO2. The CO2 data are used to obtain the atmospheric pressure profile.

------- UARS, TAYLOR---

INVESTIGATION NAME- AN IMPROVED STRATOSPHERIC AND MESOSPHERIC SOUNDER (ISAMS)

NSSDC ID- UARS-1 -11 INVESTIGATIVE PROGRAM CODE EE/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
METEOROLOGY
PLANETARY ATMOSPHERES

PERSONNEL

PI - F.W.	TAYLOR	OXFORD U
OI - R.	HUNNEMAN	READING U
OI - H.	HADLEY	RUTHERFORD APPLETON L.
OI - K.H.	DAVIES	RUTHERFORD APPLETON L.
OI - G.D.	PESKETT	OXFORD U
OI - C.D.	RODGERS	OXFORD U
OI - E.J.	WILLIAMSON	OXFORD U
OI - J.J.	BARNETT	OXFORD U
OI - J.G.	WHITNEY	OXFORD U
OI - C.A.	BAILEY	OXFORD U
OI - G.R.	THORTON	OXFORD U
OI - J.S.	SEELEY	READING U
OI - J.M.	RUSSELL, 3RD	NASA-LARC

BRIEF DESCRIPTION

The investigation objective is to make global measurements of radiation from CO2, H2O, CO, NO, N2O, and CH4. These measurements yield (1) the kinetic temperature, vibrational temperature, and altitude distribution for CO2; (2) the H2O concentration from 15 to 110 km; (3) the CO altitude distribution; (4) the NO altitude distribution; (5) the N2O altitude distribution; and (6) the CH4 altitude distribution. These parameters are obtained as a function of time and location. The improved stratospheric and mesospheric sounder is an infrared radiometer observing thermal emission and resonance fluorescence of solar radiation from the atmospheric limb by gas correlation spectroscopy. The spectral range covered is 2.7 to 100 micrometers. The altitude range extends

(to approximately 1 deg K accuracy) and composition (to approximately 10% accuracy) can be made with a vertical resolution better than 3 km and a horizontal resolution of 400 km (limited by geometry of limb path).

------- UARS, THUILLIER --

INVESTIGATION NAME- TEMPERATURE AND WIND MEASUREMENT IN THE MESOSPHERE AND LOWER THERMOSPHERE

NSSDC ID- UARS-1 -01

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL

PI - G.	THUILLIER	CNRS-SA
OI - P.	CONNES	PARIS OBSERVATORY
OI - H.	TEITELBAUM	CNRS-SA
OI - M.L.	DUBOIN	CNET
OI - P.	BLUM	U OF BONN
OI - S.S.	CHANDRA	NASA-GSFC
OI - A.	CHEDIN	CNRS-SA
OI - N.	SCOTT	CNRS-SA

BRIEF DESCRIPTION

The investigation objectives are to measure simultaneously the wind and temperature in the high mesosphere and low thermosphere, using a remote sensing method, and to derive the eddy diffusion coefficient. Absolute line intensities of the wavelengths listed below are also measured. The flight instrument is composed of two main units. The upper part is a Cassegrain-type telescope. The lower part consists of a field-compensated Michelson interferometer and associated optics, detectors, laser unit, electromechanisms, and electronics. The wavelengths measured are 5577, 6300, 7278, 7319, and 7371 A. The spectral scanning is achieved by a small-angle prism, changing the optical path approximately 1 wavelength in 16 steps. The limb is scanned in steps from 400 to 70 km. The field of view is 2 deg in a horizontal plane and the vertical field of view varies from 16 arc-min in the thermosphere to 4 arc-min for mesospheric observations. The duration of a complete scan for a given line is 1.6 s.

------- UARS, WATERS --

INVESTIGATION NAME- MICROWAVE LIMB SOUNDER (MLS)

NSSDC ID- UARS-1 -13

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
METEOROLOGY
PLANETARY ATMOSPHERES

PERSONNEL

PI - J.W.	WATERS	NASA-JPL
OI - R.	JARNOT	NASA-JPL
OI - H.	PICKETT	NASA-JPL
OI - W.	WILSON	NASA-JPL
OI - P.	ZIMMERMAN	NASA-JPL

BRIEF DESCRIPTION

The objective of the microwave limb sounder (MLS) investigation is to measure O3, ClO, H2O2, and the magnetic field and pressure in the upper atmosphere. The spectral region covered is from 63 to 205 GHz. The sampled altitude range extends from 15 to 110 km. The instrument has a 2-s integration time with longer integrations performed as appropriate during data reduction. Absolute accuracy of the MLS is approximately 5% for composition, and approximately 2 deg K for temperature. Vertical resolution for profile measurements is 3 to 6 km; horizontal resolution is 30 km across and 300 km along the observation direction. Complete profiles are obtained in less than 50 s.

------- UARS, WHITE --

INVESTIGATION NAME- THEORETICAL INVESTIGATION PHYSICS, CHEMISTRY, AND DYNAMICS-STRATOSPHERE

NSSDC ID- UARS-1 -25

INVESTIGATIVE PROGRAM
CODE EE/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL

PI - P.	WHITE	METEOROLOGICAL OFFICE
OI - A.F.	TUCK	METEOROLOGICAL OFFICE
OI - A.	O'NEILL	METEOROLOGICAL OFFICE

further the understanding of the stratosphere, and to study its interactions with the troposphere. These objectives are achieved through two primary activities, analysis and diagnosis. A comprehensive three-dimensional numerical model of the troposphere and stratosphere is used.

------- UARS, WILLSON --

INVESTIGATION NAME- INSTRUMENT OF OPPORTUNITY-ACTIVE CAVITY RADIOMETER

NSSDC ID- UARS-1 -27

INVESTIGATIVE PROGRAM
CODE EE, SCIENCE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
SOLAR PHYSICS

PERSONNEL

EM - R.C.	WILLSON	NASA-JPL
ES - R.C.	WILLSON	NASA-JPL

BRIEF DESCRIPTION

The objective of this experiment is the measurement of the total solar irradiance with state-of-the-art accuracy and precision. This experiment is part of a long-term program of extra-atmospheric observations to determine the magnitude and direction of variations in the output of the total solar-optical energy. The instrument measures solar output from the far UV through the far IR wavelengths using three, electrically self-calibrated, cavity detector pyrheliometers each capable of defining the absolute irradiance with an uncertainty of plus or minus 0.1%, and with a resolution of plus or minus 0.02%.

------- UARS, WINNINGHAM --

INVESTIGATION NAME- PARTICLE ENVIRONMENT MONITOR (PEM)

NSSDC ID- UARS-1 -07

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PLANETARY ATMOSPHERES
PARTICLES AND FIELDS

PERSONNEL

PI - J.D.	WINNINGHAM	SOUTHWEST RES INST
OI - P.M.	BANKS	STANFORD U
OI - J.L.	BURCH	SOUTHWEST RES INST
OI - H.D.	VOSS	LOCKHEED PALO ALTO
OI - W.L.	IMHOF	LOCKHEED PALO ALTO
OI - J.B.	REAGAN	LOCKHEED PALO ALTO
OI - M.H.	REES	U OF ALASKA
OI - G.C.	REID	NOAA-ERL
OI - R.G.	ROBLE	NATL CTR FOR ATMOS RES
OI - P.J.	CRUTZEN	MPI-CHEMISTRY
OI - T.A.	POTEMRA	APPLIED PHYSICS LAB
OI - R.W.	NIGHTENGALE	LOCKHEED PALO ALTO

BRIEF DESCRIPTION

The objective of this investigation is to determine the global input of charged-particle energy into the earth's stratosphere, mesosphere, and thermosphere, and to understand the atmospheric processes involved. Direct in situ measurements of precipitation electrons in the energy range from 100 eV to 5 MeV and of protons in the energy range from 100 eV to 200 MeV are made with a medium-energy particle spectrometer (MEPS) and a high-energy particle spectrometer (HEPS). In addition, global images and energy spectra of atmospheric X rays produced by electron precipitation are obtained over the energy range from 6 to 150 keV with an atmospheric X-ray imaging spectrometer. The data from these instruments are used as input to computational models.

------- UARS, ZUREK --

INVESTIGATION NAME- RADIATIVE-DYNAMIC BALANCES IN THE MESOSPHERE

NSSDC ID- UARS-1 -23

INVESTIGATIVE PROGRAM
CODE EE, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL

PI - R.W.	ZUREK	NASA-JPL

BRIEF DESCRIPTION

The overall objective of this theoretical investigation is to construct a comprehensive and consistent climatology model of the mesosphere as observed by UARS. From the mesospheric data, this analysis produces (1) the radiative budget based on O3 and O2 absorption of solar radiance and CO2 emission, including the effects of the latter on non-thermodynamic equilibrium; and (2) the dynamical climatology features of the mesosphere, showing the relative contributions to the heat and momentum budgets by adiabatic

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heating, by the mean meridional circulation, and by eddies (waves). The eddy contribution is separated into standing and transient components which include dynamical fluxes due to atmospheric tides.

*************************** ULYSSES***************************

SPACECRAFT COMMON NAME- ULYSSES
ALTERNATE NAMES- ISPM-B, ISP
INTERNATIONL SOLAR POLAR, SOLAR POLAR
ISPM/CENTAUR, ISPM

NSSDC ID- ISPESA

LAUNCH DATE- 05/23/86 WEIGHT- 370. KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHTLE-CGP

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- HELIOCENTRIC
ORBIT PERIOD- 2190. DAYS INCLINATION- 81. DEG
PERIAPSIS- 1.1 AU RAD APOAPSIS- 5.0 AU RAD

PERSONNEL

PM - D.	EATON	ESA-ESTEC
PS - K.P.	WENZEL	ESA-ESTEC

BRIEF DESCRIPTION

The primary objectives of ULYSSES, formerly the International Solar Polar Mission (ISPM), are to investigate, as a function of solar latitude, the properties of the solar wind, the sun-wind interface, the heliospheric magnetic field, solar X rays, solar radio bursts and plasma waves, solar and galactic cosmic rays, and the interplanetary/interstellar neutral dust and gas. ISPM also investigates cosmic gamma-ray bursts and searches for gravitational waves. Secondary objectives include interplanetary and planetary physics investigations during the initial Earth-Jupiter phase and investigations in the Jovian magnetosphere. Following the Jupiter swingby, the spacecraft travels in a heliocentric orbit with high heliographic inclination, and passes over the rotational poles of the sun. Radio-science interdisciplinary/theoretical investigations are conducted in addition to the operation of nine scientific instruments. The ISPM spacecraft is spin stabilized at a rate of 5 rpm and its high-gain antenna points continuously to the earth. It carries a scientific payload of 55 kg and is powered by a single radio-isotope generator providing 290 W of power. The telemetry system operates in the X-band (8 GHz). A low-power S-band (2 GHz) transmitter is also carried for dual-frequency radio-science investigations and early orbit maneuvers. The uplink telecommunication system works in S-band. Throughout the mission the spacecraft will be tracked by the 34-m antennas of NASA's Deep Space Network for 8 hours per day, providing real-time data at a rate of 1024 bps. During the remaining 16 hours data are stored onboard at a rate of 512 bps, and played back during the next tracking period. The original mission plans consisted of two spacecraft, one built by ESA and the other by NASA. NASA cancelled its spacecraft in 1981. The list of theoretical and interdisciplinary investigators is given in Appendix B10.

------- ULYSSES, BAME--

INVESTIGATION NAME- PLASMA SPECTROMETER

NSSDC ID- ISPESA -05 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - S.J.	BAME	LOS ALAMOS NAT LAB
OI - J.R.	ASBRIDGE	LOS ALAMOS NAT LAB
OI - A.	BARNES	NASA-ARC
OI - W.C.	FELDMAN	LOS ALAMOS NAT LAB
OI - J.T.	GOSLING	LOS ALAMOS NAT LAB
OI - T.E.	HOLZER	NATL CTR FOR ATMOS RES
OI - M.M.	NEUGEBAUER	NASA-JPL
OI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - G.L.	SISCOE	U OF CALIF, LA
OI - S.T.	SUESS	NOAA-ERL
OI - R.D.	ZWICKL	LOS ALAMOS NAT LAB
OI - B.E.	GOLDSTEIN	NASA-JPL

BRIEF DESCRIPTION

The objectives of this investigation are (1) to investigate and characterize bulk-flow parameters and internal-state conditions of the solar wind as functions of solar latitude; (2) to investigate radial variations of solar wind properties between Earth and Jupiter; and (3) to investigate the solar wind interactions with the Jovian magnetosphere. The instrument consists of two sensor systems and associated electronics that interface with the spacecraft. Electrons in the energy range between 1 and 900 eV are measured by a 120-deg spherical-section electrostatic analyzer with seven channel electron multipliers (CEMs) which cover a polar angle range of 146 deg. The plate spacing is 0.35 cm and the average radius of curvature is 4.2 cm. The solar wind ion analyzer makes three-dimensional measurements of solar-wind ions with energies in the range between 257 eV and 35 keV per charge. It consists of a 105-deg spherical-section electrostatic analyzer fitted with 16 CEM sensors which cover a polar angle range of 80 deg. It is mounted so that the first CEM views along the spin axis direction and the sixteenth at a polar angle of 75 deg from the spin axis. A stepping motor is used to rotate any one of seven apertures into place. The mass of the electron instrument is 2.6 kg. It uses 2.6 W of power and has a data rate of 24 bps in storage mode and 48 bps in tracking mode. The mass of the ion instrument is 4.1 kg. It uses 2.9 W mean and 7 W peak power, and has a data rate of 56 bps in storage mode and 112 bps in tracking mode.

------- ULYSSES, BERTOTTI--

INVESTIGATION NAME- RADIO SCIENCE

NSSDC ID- ISPESA -11 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
RADIO PHYSICS
HIGH ENERGY ASTROPHYSICS

PERSONNEL

PI - B.	BERTOTTI	U OF PAVIA
OI - A.J.	ANDERSON	U OF UPPSALA
OI - P.	BONIFAZI	CNR, SPACE PLASMA LAB
OI - M.	DOBROWOLNY	CNR, SPACE PLASMA LAB
OI - H.G.	SCHERNECK	U OF UPPSALA

BRIEF DESCRIPTION

The objective of this radio science investigation is to search for low-frequency (1.E-4 to 1.E-2 Hz) gravitational waves expected to be generated by the violent collapse of stars, galactic nuclei and other astrophysical objects, and for a gravitational wave background. Doppler data to be analyzed for characteristic signatures are recorded during phases of the ISPM opposition, using the spacecraft telecommunication system and the NASA DSN. Correlative measurements with Galileo are planned.

------- ULYSSES, GLOECKLER--

INVESTIGATION NAME- SOLAR WIND ION COMPOSITION SPECTROMETER

NSSDC ID- ISPESA -04 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - G.	GLOECKLER	U OF MARYLAND
OI - J.	GEISS	U OF BERNE
OI - H.	BALSIGER	U OF BERNE
OI - L.A.	FISK	U OF NEW HAMPSHIRE
OI - F.O.	GLIEM	BRAUNSCHWEIG TECH U
OI - F.M.	IPAVICH	U OF MARYLAND
OI - J.	MCKENZIE	DANISH SPACE RES INST
OI - K.W.	OGILVIE	NASA-GSFC
OI - W.	STUDEMANN	MPI-AERONOMY
OI - B.	WILKEN	MPI-AERONOMY

BRIEF DESCRIPTION

This investigation utilizes a Solar Wind Ion Composition Spectrometer (SWICS) to determine the elemental and ionic composition, temperatures, and mean speeds of all major solar wind ions from H through Fe. The range of wind speed covered is 145 through 1350 km/s, and the energy/charge (E/Q) range is 110 eV/Q through 66.7 keV/Q. Collimated ions first enter an electrostatic analyzer and are post-accelerated, after exit, by a fixed 30-kV potential (V) into a time-of-flight (T) chamber and then into a solid state detector which measures the energy, E+V. From the measured values of E/Q, T, and E+V, the energy, charge, and mass of an entering ion are fully determined. The instrument has a mass of 5.6 kg, uses 3.6 W mean and 4.7 W peak power, and has a data rate of 44 bps in storage mode and 88 bps in tracking mode.

------- ULYSSES, GRUN--

INVESTIGATION NAME- COSMIC DUST

NSSDC ID- ISPESA -07 INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
DUST

PERSONNEL

PI - E.	GRUN	MPI-NUCLEAR PHYS
OI - H.	FECHTIG	MPI-NUCLEAR PHYS
OI - R.H.	GIESE	RUHR-U BOCHUM
OI - J.	KISSEL	MPI-NUCLEAR PHYS
OI - G.E.	MORFILL	MPI-PHYS/ASTROPHYS
OI - J.A.M.	MCDONNELL	U OF KENT, CANTERBURY
OI - H.A.	ZOOK	NASA-JSC
OI - G.H.	SCHWEHM	RUHR-U BOCHUM

BRIEF DESCRIPTION

The objectives of this investigation are to study particulate matter with masses between 5.E-19 and 5.E-10 g in the heliosphere; to determine its physical and dynamical properties as a function of ecliptic latitude and heliocentric distance; and to investigate its interaction with other interplanetary/interstellar phenomena such as solar radiation, solar wind, heliospheric magnetic field, and interstellar neutral gas. The instrument is a multicoincidence plasma impact detector which measures mass, speed, flight direction and electric charge of individual dust particles. The instrument has a mass of 3.75 kg and uses 2.0 W of power. The data rate is 8 bps.

------- ULYSSES, HEDGECOCK---

INVESTIGATION NAME- MAGNETIC FIELD

NSSDC ID- ISPESA -08

INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL

PI - P.C.	HEDGECOCK	IMPERIAL COLLEGE
OI - A.	BALOGH	IMPERIAL COLLEGE
OI - E.J.	SMITH	NASA-JPL
OI - B.T.	TSURUTANI	NASA-JPL

BRIEF DESCRIPTION

The objectives of this investigation are to determine the strength and geometry of the interplanetary magnetic field in the inner heliosphere (particularly at high solar latitudes) and to investigate the heliographic latitude dependence of the field fluctuation spectra with special emphasis on the frequency range below 0.01 Hz. Secondary objectives are to study the internal dynamics of the solar wind, the role of discontinuities and waves in the interplanetary field on propagation and acceleration of energetic particles, the interplanetary propagation and development of discontinuities and waves, and the structure and dynamics of the dusk region of the Jovian magnetosphere. The instrument consists of a triaxial fluxgate magnetometer, a vector helium magnetometer, and associated electronics. The instrument has a mass of 4.75 kg and uses 5.4 W of power. It has a data rate of 40 bps in the cruise mode and 80 bps in the tracking mode.

------- ULYSSES, HURLEY---

INVESTIGATION NAME- SOLAR-FLARE X-RAYS AND COSMIC GAMMA RAY BURSTS

NSSDC ID- ISPESA -01

INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
GAMMA-RAY ASTRONOMY
X-RAY ASTRONOMY

PERSONNEL

PI - K.C.	HURLEY	CESR
OI - M.K.	SOMMER	MPI-EXTRATERR PHYS
OI - T.L.	CLINE	NASA-GSFC
OI - C.	DE JAGER	U OF UTRECHT
OI - J.	HEISE	U OF UTRECHT
OI - J.C.	HENOUX	PARIS OBSERVATORY
OI - M.	NIEL	CESR
OI - G.	PASCHMANN	MPI-EXTRATERR PHYS
OI - G.	VEDRENNE	CESR

BRIEF DESCRIPTION

The objectives of this investigation are to study the acceleration and storage of energetic electrons accelerated during solar flares by measuring solar X-radiation; to identify gamma-ray burst sources with known celestial objects or phenomena; and to study plasma and energetic charged particle processes in the Jovian magnetosphere. The instrument consists of two hemispherical cesium iodide (sodium) crystals coupled to curved cathode photomultipliers; two small solid-state detectors with an americium 241 radioactive source deposited on the sensors, and a digital electronics unit. The scintillation counters measure X rays in the energy range from 15 to 150 keV, while the solid state detectors measure X rays from 5 to 15 keV. The instrument has a mass of 2.0 kg, uses 2.6 W of power, and has a data rate of 20 bps in storage mode and 40 bps in tracking mode.

------- ULYSSES, KEPPLER---

INVESTIGATION NAME- ENERGETIC PARTICLE COMPOSITION AND NEUTRAL GAS

NSSDC ID- ISPESA -12

INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
PARTICLES AND FIELDS
ASTRONOMY

PERSONNEL

PI - E.	KEPPLER	MPI-AERONOMY
OI - J.B.	BLAKE	AEROSPACE CORP
OI - H.J.	FAHR	U OF BONN
OI - D.K.	HOVESTADT	MPI-EXTRATERR PHYS
OI - B.K.G.	HULTQVIST	KIRUNA GEOPHYS INST
OI - G.E.	MORFILL	MPI-PHYS/ASTROPHYS
OI - J.J.	QUENBY	IMPERIAL COLLEGE
OI - A.K.	RICHTER	MPI-AERONOMY
OI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - A.	KORTH	MPI-AERONOMY

BRIEF DESCRIPTION

The objectives of this investigation are (1) to study the composition, energy spectra and spatial distribution of ions in the energy range 80 keV/nucleon to 15 MeV/nucleon and (2) to study the temperature, bulk velocity and density of the interstellar neutral gas in the vicinity of the solar system. The investigation comprises two independent sensor systems, the ion measurements being made by a set of four solid state detector telescopes with active anticoincidence shields having a total geometric factor of 0.4 sq cm-sr. The front element of each telescope is an epitaxial silicon detector of 5 micrometer thickness. The neutral gas sensor uses a channeltron to amplify and count secondary electrons produced by neutral particle impact on a lithium fluoride surface. The latter is periodically refreshed via a heated filament. Automatic scanning of the neutral gas sensor is provided by a stepping motor, and a mechanical collimator suppresses charged particles and photoelectrons. The complete instrument has a mass of 4.4 kg and uses 3.1 W of power. The data rate is 16 bps in the tracking mode.

------- ULYSSES, LANZEROTTI---

INVESTIGATION NAME- LOW ENERGY PARTICLE SPECTRUM, COMPOSITION, AND ANISOTROPY

NSSDC ID- ISPESA -03

INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL

PI - L.J.	LANZEROTTI	BELL TELEPHONE LAB
OI - K.A.	KINSEY	U OF CALIF, BERKELEY
OI - T.P.	ARMSTRONG	U OF KANSAS
OI - R.E.	GOLD	APPLIED PHYSICS LAB
OI - S.M.	KRIMIGIS	APPLIED PHYSICS LAB
OI - R.P.	LIN	U OF CALIF, BERKELEY
OI - M.	PICK	PARIS OBSERVATORY
OI - E.C.	ROELOF	APPLIED PHYSICS LAB
OI - E.T.	SARRIS	U OF THRACE
OI - G.M.	SIMNETT	U OF BIRMINGHAM

BRIEF DESCRIPTION

The objectives of this investigation are (1) to investigate the solar-flare process with measurements of non-relativistic and relativistic electrons, and non-relativistic ions, and their dependence on heliolatitude; (2) to investigate solar elemental abundances with measurements of chemical composition of nuclei of solar origin at all heliolatitudes; (3) to investigate the interplanetary propagation of solar energetic particles by measurement of anisotropy and composition parameters; (4) to investigate acceleration processes; and (5) to investigate temporal and spatial variations of particle intensity in and near the Jovian magnetosphere. The instrumentation consists of two double-ended solid state detector systems which measure ions in the range 50 keV to 5 MeV and electrons in the range 30 to 300 keV, and a (dE/dX, E) telescope using a 5-micrometer-thick front detector for ion elemental abundances in the range 1 to 15 MeV/nucleon (Fe). Each double-ended system is composed on one end of a foil spectrometer in which a 0.35 mg/sq cm thin foil excludes ions below 0.350 keV, allowing electrons above 30 keV to be detected. Further, one of the other ends of one of the systems is a magnetic spectrometer, using a rare-earth magnet to separate electrons from ions (geometric factor for ions is approximately 0.5 sq cm-sr, and for electrons 0.05 sq cm-sr). Orientation of the sensor systems is such that complete pitch-angle coverage is obtained. The instrument has a mass of 5.8 kg including shielding, and uses 4.0 W of power. The data rate is 80 bps in cruise mode and 160 bps in tracking mode.

------- ULYSSES, SIMPSON---

INVESTIGATION NAME- COSMIC RAY AND CHARGED PARTICLE

NSSDC ID- ISPESA -02

INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

ORIGINAL PAGE IS
OF POOR QUALITY

PERSONNEL

PI - J.A.	SIMPSON	U OF CHICAGO
OI - J.D.	ANGLIN	NATL RES COUNC OF CAN
OI - A.	BALOGH	IMPERIAL COLLEGE
OI - M.	BERCOVITCH	NATL RES COUNC OF CAN
OI - J.R.	BURROWS	NATL RES COUNC OF CAN
OI - C.	CESARSKY	CENS
OI - J.A.	EARL	U OF MARYLAND
OI - J.J.	ENGELMANN	CENS
OI - M.	GARCIA-MUNOZ	U OF CHICAGO
OI - R.J.	HYNDS	IMPERIAL COLLEGE
OI - L.	KOCH-MIRAMOND	CENS
OI - H.W.	KUNOW	U OF KIEL
OI - R.G.	MARSDEN	ESA-ESTEC
OI - R.B.	MCKIBBEN	U OF CHICAGO
OI - R.	MULLER-MELLIN	U OF KIEL
OI - C.	PAIZIS	U OF MILAN
OI - E.N.	PARKER	U OF CHICAGO
OI - I.L.	RASMUSSEN	DANISH SPACE RES INST
OI - A.	RAVIART	CENS
OI - R.	REINHARD	ESA-ESTEC
OI - T.R.	SANDERSON	ESA-ESTEC
OI - H.J.	VOLK	MPI-NUCLEAR PHYS
OI - K.P.	WENZEL	ESA-ESTEC
OI - G.H.	WIBBERENZ	U OF KIEL
OI - M.	WITTE	MPI-AERONOMY

BRIEF DESCRIPTION

The objectives of this investigation are to study the energy, charge, and mass spectra of energetic charged particles in interplanetary space in the energy range from approximately 0.5 MeV/nucleon (for protons) to approximately 100 MeV/nucleon; and to study spatial gradients and the propagation of charged particles throughout the heliosphere by measuring absolute flux and vector anisotropy. The instrument consists of six charged-particle telescopes (CPT) and associated electronics. A high-energy telescope provides measurements of the chemical and isotopic composition and of the energy spectrum of the cosmic radiation above approximately 10 MeV/nucleon. A low-energy telescope (LET) extends chemical composition and spectral measurements downward to <1 MeV/nucleon. The anisotropy telescopes, in conjunction with the LET, provide a means of determining the distribution of arrival directions in three dimensions of low-energy protons and He nuclei. A high-flux telescope provides measurements of the intensity and arrival direction of protons, He, C, N, O, and Fe-group nuclei in high-flux environments, such as intense solar flares or Jupiter's magnetosphere, where the other sensor systems may become saturated. Each CPT provides output to a data-processing unit (DPU). The electron telescope consists of a double Cerenkov and semiconductor detector telescope which interfaces with the DPU. The instrument has a mass of 14.6 kg including shielding and uses 14.6 W of power. The data rate is 80 bps in cruise mode and 160 bps in tracking mode.

------- ULYSSES, STONE---

INVESTIGATION NAME- UNIFIED RADIO AND PLASMA WAVE

NSSDC ID- ISPESA -06

INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL

PI - R.G.	STONE	NASA-GSFC
OI - P.	COUTURIER	PARIS OBSERVATORY
OI - J.	FAINBERG	NASA-GSFC
OI - R.E.	GENDRIN	CNET
OI - M.L.	GOLDSTEIN	NASA-GSFC
OI - C.C.	HARVEY	PARIS OBSERVATORY
OI - S.	HOANG	PARIS OBSERVATORY
OI - M.L.	KAISER	NASA-GSFC
OI - P.J.	KELLOGG	U OF MINNESOTA
OI - J.	LAVERGNAT	CNRS-LGE
OI - P.	RODRIGUEZ	US NAVAL RESEARCH LAB
OI - J.L.	STEINBERG	PARIS OBSERVATORY
OI - R.R.	WEBER	NASA-GSFC
OI - J.M.	ETCHETO	CNET

BRIEF DESCRIPTION

The objectives of this investigation are (1) to investigate source positions of travelling solar radio bursts in the range from dc to 1 MHz; (2) to investigate the large-scale magnetic field topology and the electron density along the exciter trajectory as a function of heliographic latitude and longitude at distances of 0.1 AU to approximately 5 AU; (3) to investigate Jovian radio source locations in the range from dc to 1 MHz; and (4) to investigate waves in the plasma between dc and 35 kHz, their instabilities, their energy transport mechanisms, and the thermal electron density. The instrument comprises three antenna systems (a 70-m tip-to-tip dipole in the equatorial plane, a monopole along the spin axis, and a pair of crossed-axis magnetic search coils) and four receiver systems (an rf receiver for the 1.25-kHz to 1-MHz range in two intervals from 1.25 to 48.5 kHz and from 52 to 940 kHz; a plasma frequency receiver covering from 0.57 to 35 kHz in 32 contiguous intervals; a fast envelope sampler from 10 Hz to 60 kHz with four commandable decade ranges to capture transient events; and a wave form analyzer, dc to 500 Hz, that operates in two frequency bands, from dc to 10 Hz and from 10 to 500 Hz). It also includes an active sounder for determining the ambient electron density. The instrument has a mass of 7.3 kg, excluding antennas and booms, and has a data rate of 116 bps in storage mode and 232 bps in tracking mode. It uses 9.9 W mean power and 10.4 W when the sounder is operated.

------- ULYSSES, VOLLAND---

INVESTIGATION NAME- CORONAL SOUNDING

NSSDC ID- ISPESA -10

INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
RADIO PHYSICS

PERSONNEL

PI - H.E.	VOLLAND	U OF BONN
OI - M.K.	BIRD	U OF BONN
OI - P.	EDENHOFER	RUHR-U BOCHUM

BRIEF DESCRIPTION

The objective of this radio science investigation is to determine the density, turbulence spectrum, and velocity of the coronal plasma in the acceleration regime of the solar wind. Dual-frequency ranging and Doppler data are recorded during phases of the ULYSSES superior conjunction using the spacecraft transmitters and the NASA DSN.

*************************** VENUS RADAR MAPPER ***************

SPACECRAFT COMMON NAME- VENUS RADAR MAPPER
ALTERNATE NAMES- VRM

NSSDC ID- VRM

LAUNCH DATE- 03/00/88 WEIGHT- KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- VENUS ORBITER
ORBIT PERIOD- 222. MIN INCLINATION- 90. DEG
PERIAPSIS- 250. KM ALT APOAPSIS- 10300. KM ALT

PERSONNEL

MG - R.	MILLS	NASA HEADQUARTERS
SC - J.	BOYCE	NASA HEADQUARTERS
PM - R.S.	SAUNDERS	NASA-JPL

BRIEF DESCRIPTION

The Venus Radar Mapper (VRM) is a low-cost mission developed by JPL. The science objectives are (1) to map more than 70% of Venus at resolutions equivalent to 1 km/line pair, or better; (2) to obtain 100-m vertical resolution altimeter data over as much of the planet as possible; and (3) make gravity field measurements over areas not covered by Pioneer Venus Orbiter. The spacecraft uses protoflight units from Voyager preflight testing. Electric power is supplied by two large solar panels that have one degree of freedom for their motion. The Synthetic Aperture Radar (SAR) electronics are contained between the bus portion of the spacecraft and a 3.7-m antenna. The interplanetary trajectory, which will be Type I, will bring the spacecraft to Venus in late July 1988. The nominal mission will last 243 days and will observe 360 deg of Venus longitude.

------- VENUS RADAR MAPPER, PETTENGILL-------------------------

INVESTIGATION NAME- SYNTHETIC APERTURE RADAR

NSSDC ID- VRM -01

INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY

PERSONNEL

PI - G.	PETTENGILL	MASS INST OF TECH

BRIEF DESCRIPTION

The VRM Synthetic Aperture Radar (SAR) is able to operate between altitudes of 1,900 and 250 km, with look angles ranging between 51 deg for the lowest altitudes and 24 deg for the maximum. Data can be taken from higher altitudes at the cost of reduced signal-to-noise ratio. The SAR is designed to map a long and narrow strip of Venus on every orbit. It does this by rotating so that the 3.7-m antenna points at the planet and then activates the SAR system when the spacecraft altitude falls below 1,900 km. A continuous swath of Venus images can be obtained and stored on a tape recorder. The SAR look angle constantly changes as the spacecraft moves toward periapsis. It continues mapping until the altitude again reaches 1,900 km and then stops. When a mapping pass is completed, the spacecraft points the antenna toward earth and transmits the image swath at a data rate of 250 kbps. When the data have been transmitted, the spacecraft is near the point where the next swath must be taken and the whole process is repeated. Swath overlap varies, but averages 5 km. The swath coverage is approximately 25 x 14,800 km. The frequency used is in the

PERSONNEL

PI - J.A.	SIMPSON	U OF CHICAGO
OI - J.D.	ANGLIN	NATL RES COUNC OF CAN
OI - A.	BALOGH	IMPERIAL COLLEGE
OI - M.	BERCOVITCH	NATL RES COUNC OF CAN
OI - J.R.	BURROWS	NATL RES COUNC OF CAN
OI - C.	CESARSKY	CENS
OI - J.A.	EARL	U OF MARYLAND
OI - J.J.	ENGELMANN	CENS
OI - M.	GARCIA-MUNOZ	U OF CHICAGO
OI - R.J.	HYNDS	IMPERIAL COLLEGE
OI - L.	KOCH-MIRAMOND	CENS
OI - H.W.	KUNOW	U OF KIEL
OI - R.G.	MARSDEN	ESA-ESTEC
OI - R.B.	MCKIBBEN	U OF CHICAGO
OI - R.	MULLER-MELLIN	U OF KIEL
OI - C.	PAIZIS	U OF MILAN
OI - E.N.	PARKER	U OF CHICAGO
OI - I.L.	RASMUSSEN	DANISH SPACE RES INST
OI - A.	RAVIART	CENS
OI - R.	REINHARD	ESA-ESTEC
OI - T.R.	SANDERSON	ESA-ESTEC
OI - H.J.	VOLK	MPI-NUCLEAR PHYS
OI - K.P.	WENZEL	ESA-ESTEC
OI - G.H.	WIBBERENZ	U OF KIEL
OI - M.	WITTE	MPI-AERONOMY

BRIEF DESCRIPTION

The objectives of this investigation are to study the energy, charge, and mass spectra of energetic charged particles in interplanetary space in the energy range from approximately 0.5 MeV/nucleon (for protons) to approximately 100 MeV/nucleon; and to study spatial gradients and the propagation of charged particles throughout the heliosphere by measuring absolute flux and vector anisotropy. The instrument consists of six charged-particle telescopes (CPT) and associated electronics. A high-energy telescope provides measurements of the chemical and isotopic composition and of the energy spectrum of the cosmic radiation above approximately 10 MeV/nucleon. A low-energy telescope (LET) extends chemical composition and spectral measurements downward to <1 MeV/nucleon. The anisotropy telescopes, in conjunction with the LET, provide a means of determining the distribution of arrival directions in three dimensions of low-energy protons and He nuclei. A high-flux telescope provides measurements of the intensity and arrival direction of protons, He, C, N, O, and Fe-group nuclei in high-flux environments, such as intense solar flares or Jupiter's magnetosphere, where the other sensor systems may become saturated. Each CPT provides output to a data-processing unit (DPU). The electron telescope consists of a double Cerenkov and semiconductor detector telescope which interfaces with the DPU. The instrument has a mass of 14.6 kg including shielding and uses 14.6 W of power. The data rate is 80 bps in cruise mode and 160 bps in tracking mode.

------- ULYSSES, STONE---

INVESTIGATION NAME- UNIFIED RADIO AND PLASMA WAVE

NSSDC ID- ISPESA -06

INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL

PI - R.G.	STONE	NASA-GSFC
OI - P.	COUTURIER	PARIS OBSERVATORY
OI - J.	FAINBERG	NASA-GSFC
OI - R.E.	GENDRIN	CNET
OI - M.L.	GOLDSTEIN	NASA-GSFC
OI - C.C.	HARVEY	PARIS OBSERVATORY
OI - S.	HOANG	PARIS OBSERVATORY
OI - M.L.	KAISER	NASA-GSFC
OI - P.J.	KELLOGG	U OF MINNESOTA
OI - J.	LAVERGNAT	CNRS-LGE
OI - P.	RODRIGUEZ	US NAVAL RESEARCH LAB
OI - J.L.	STEINBERG	PARIS OBSERVATORY
OI - R.R.	WEBER	NASA-GSFC
OI - J.M.	ETCHETO	CNET

BRIEF DESCRIPTION

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------- ULYSSES, VOLLAND---

INVESTIGATION NAME- CORONAL SOUNDING

NSSDC ID- ISPESA -10

INVESTIGATIVE PROGRAM
CODE EZ/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
RADIO PHYSICS

PERSONNEL

PI - H.E.	VOLLAND	U OF BONN
OI - M.K.	BIRD	U OF BONN
OI - P.	EDENHOFER	RUHR-U BOCHUM

BRIEF DESCRIPTION

The objective of this radio science investigation is to determine the density, turbulence spectrum, and velocity of the coronal plasma in the acceleration regime of the solar wind. Dual-frequency ranging and Doppler data are recorded during phases of the ULYSSES superior conjunction using the spacecraft transmitters and the NASA DSN.

**************************** VENUS RADAR MAPPER****************

SPACECRAFT COMMON NAME- VENUS RADAR MAPPER
ALTERNATE NAMES- VRM

NSSDC ID- VRM

LAUNCH DATE- 03/00/88 WEIGHT- KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- VENUS ORBITER
ORBIT PERIOD- 222. MIN INCLINATION- 90. DEG
PERIAPSIS- 250. KM ALT APOAPSIS- 10300. KM ALT

PERSONNEL

MG - R.	MILLS	NASA HEADQUARTERS
SC - J.	BOYCE	NASA HEADQUARTERS
PM - R.S.	SAUNDERS	NASA-JPL

BRIEF DESCRIPTION

The Venus Radar Mapper (VRM) is a low-cost mission developed by JPL. The science objectives are (1) to map more than 70% of Venus at resolutions equivalent to 1 km/line pair, or better; (2) to obtain 100-m vertical resolution altimeter data over as much of the planet as possible; and (3) make gravity field measurements over areas not covered by Pioneer Venus Orbiter. The spacecraft uses protoflight units from Voyager preflight testing. Electric power is supplied by two large solar panels that have one degree of freedom for their motion. The Synthetic Aperture Radar (SAR) electronics are contained between the bus portion of the spacecraft and a 3.7-m antenna. The interplanetary trajectory, which will be Type I, will bring the spacecraft to Venus in late July 1988. The nominal mission will last 243 days and will observe 360 deg of Venus longitude.

------- VENUS RADAR MAPPER, PETTENGILL---------------------------

INVESTIGATION NAME- SYNTHETIC APERTURE RADAR

NSSDC ID- VRM -01

INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY

PERSONNEL

PI - G.	PETTENGILL	MASS INST OF TECH

BRIEF DESCRIPTION

The VRM Synthetic Aperture Radar (SAR) is able to operate between altitudes of 1,900 and 250 km, with look angles ranging between 51 deg for the lowest altitudes and 24 deg for the maximum. Data can be taken from higher altitudes at the cost of reduced signal-to-noise ratio. The SAR is designed to map a long and narrow strip of Venus on every orbit. It does this by rotating so that the 3.7-m antenna points at the planet and then activates the SAR system when the spacecraft altitude falls below 1,900 km. A continuous swath of Venus images can be obtained and stored on a tape recorder. The SAR look angle constantly changes as the spacecraft moves toward periapsis. It continues mapping until the altitude again reaches 1,900 km and then stops. When a mapping pass is completed, the spacecraft points the antenna toward earth and transmits the image swath at a data rate of 250 kbps. When the data have been transmitted, the spacecraft is near the point where the next swath must be taken and the whole process is repeated. Swath overlap varies, but averages 5 km. The swath coverage is approximately 25 x 14,800 km. The frequency used is in the

S-band, at 2375 MHz. Altimetry and radiometry investigations are accomplished by utilizing various operating modes. See Appendix B11 for a listing of the investigators.

------- VENUS RADAR MAPPER, SJOGREN---------------------------

INVESTIGATION NAME- GRAVITY FIELD MEASUREMENT

NSSDC ID- VRM -03

INVESTIGATIVE PROGRAM
CODE EL

INVESTIGATION DISCIPLINE(S)
GEODESY
PLANETOLOGY

PERSONNEL

PI - W.L.	SJOGREN	NASA-JPL
PI - M.	LEFEBVRE	CNES
OI - M.	AMANDA	AEROSPACE CORP
OI - G.	BALMINO	CNES
OI - N.	BORDERIES	CNES
OI - B.	MOYNOT	CNES

BRIEF DESCRIPTION

The objective of this investigation is to make gravity field measurements over the surface of Venus above areas that were not covered by the Pioneer Venus Orbiter. Tracking of the spacecraft will allow determination of the gravitational field.

**************************** VIKING SWEDEN ********************

SPACECRAFT COMMON NAME- VIKING SWEDEN
ALTERNATE NAMES- VIKING

NSSDC ID- VIKING

LAUNCH DATE- 10/00/85 WEIGHT- 535. KG
LAUNCH SITE- KOUROU (CENTRE SPATIAL GUYANAIS), FRENCH GUIANA
LAUNCH VEHICLE- ARIANE

SPONSORING COUNTRY/AGENCY
SWEDEN SBSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 270. MIN INCLINATION- 98.7 DEG
PERIAPSIS- 822. KM ALT APOAPSIS- 14000. KM ALT

PERSONNEL

PM - P.	ZETTERQUIST	SWEDISH SPACE CORP
PS - K.	FREDGA	SWEDISH BRD SPACE ACT

BRIEF DESCRIPTION

Viking Sweden, the first Swedish national satellite, is a polar-orbiting research satellite for exploration of magnetospheric phenomena which take place in the altitude range of 1-2 earth radii above the auroral zones. The objective of the mission is to investigate the interactions between the hot collisionless plasmas and the cold collisionless plasmas on auroral zone magnetic field lines and to relate these processes to the detailed auroral characteristics. To investigate these phenomena, Viking Sweden is instrumented for simultaneous in situ measurements of fields, particles, plasmas, and waves. In addition, an ultraviolet imager records the auroras. The payload instruments measure the following: the electrostatic vector field, the geomagnetic vector field, the cold plasma density, the hot plasma distribution function from 1 eV to 300 keV energy, the hot ion composition, all three components of electric waves of frequencies up to 500 kHz, magnetic waves of frequencies up to 10 kHz, and ultraviolet images of auroral forms. Coordinated observations from sounding rockets and with ground-based facilities such as EISCAT are expected to provide important complementary data. The Viking Sweden satellite is to be launched together with the French remote sensing satellite SPOT, a project in which Sweden participates. Initially, Viking Sweden is placed in the same orbit as SPOT, but it is to be injected into its final orbit by means of a separate boost motor. Acquisition of telemetry data and operation of the satellite take place at the Esrange ground station (67 deg, 52 min, 35 s North latitude, 21 deg, 3 min, 49 s East longitude) with a 9-m S-band facility. Only real-time telemetry is used, and the experiments are operated only when the satellite is within view of Esrange. The data rate is 55 kbps. The main body of the spacecraft has a flat octagonal shape, 0.5 m high and with a diagonal of 1.8 m. For the wave and electric measurements there are three probe pairs, one axial probe pair 8 m tip-to-tip and two orthogonal radial pairs on wire booms 80 m tip-to-tip. There are also extendable booms for the magnetometer, and a loop antenna. The satellite is spin-stabilized at 3 rpm, with the spin axis perpendicular to the orbital plane. The spin-axis direction is controlled to within 5 deg, and is to be determined afterwards to better than 1 deg accuracy. Magnetic torquing is used for attitude and spin control, and thermal control is passive. An average power of 80 W is provided by 2.2 sq m of solar cells on the satellite body. Design lifetime is 8 months, although the lifetime in orbit will be far greater than that.

------- VIKING SWEDEN, ANGER---------------------------------

INVESTIGATION NAME- ULTRAVIOLET AURORAL IMAGER

NSSDC ID- VIKING -01

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL

PI - C.D.	ANGER	U OF CALGARY
CI - A.V.	JONES	HERZBERG INST OF ASTRO
CI - G.G.	SHEPHERD	YORK U
CI - A.L.	BROADFOOT	U OF SOUTHERN CALIF
CI - G.	GUSTAFSSON	UPPSALA IONOSPHER OBS
CI - L.L.	COGGER	U OF CALGARY
CI - F.	CREUTZBERG	HERZBERG INST OF ASTRO
CI - R.L.	GATTINGER	HERZBERG INST OF ASTRO
CI - F.R.	HARRIS	HERZBERG INST OF ASTRO
CI - J.W.	HASLETT	U OF CALGARY
CI - E.J.	LLEWELLYN	U OF SASKATCHEWAN
CI - J.C.	MCCONNELL	YORK U
CI - D.J.	MCEWEN	U OF SASKATCHEWAN
CI - J.S.	MURPHREE	U OF CALGARY
CI - E.H.	RICHARDSON	DOMINION ASTROPHYS OBS
CI - G.	ROSTOKER	U OF ALBERTA
CI - D.	VENKATESAN	U OF CALGARY
CI - G.	WITT	U OF STOCKHOLM

BRIEF DESCRIPTION

The purpose of this investigation (V5) is to determine the state of substorm activity in the magnetosphere at the times during which the onboard particle and field detectors are measuring signatures worthy of study. The ultraviolet imager obtains images which show the pattern of auroral electron energy deposited in the ionosphere, viewed simultaneously over the entire auroral region and polar cap, in two wavelength regions. With an image repetition rate of once per min, or sometimes once every 20 s, the time history of this energy input can be followed as the satellite traverses the magnetospheric acceleration regions, and the foot of the field line passing through the satellite moves across the imaged ionospheric region. Images can be studied both individually and as movie sequences, thus yielding information on the detailed spatial and temporal structure of the aurora. Two optical emissions are measured, one from the atomic oxygen resonance line at 1304 A, the other from the N2 Lyman-Berge-Hopfield (LBH) bands in the 1400 - 1600 A region. The ratio of the intensities of these emissions depends on the O to N2 density ratio in the atmosphere and on the mean energy of the precipitating electrons. Detection of auroras should be possible even in the sunlit hemisphere due to the low intensity of backscattered ultraviolet light from the atmosphere. However, scattering of direct sunlight by the instrument will restrict somewhat the possibilities for viewing at the foot of the spacecraft field lines in the midnight auroral zone. The instrument is designed to obtain images with a ground resolution of better than 50 km. Reflecting optics are used to form a 25 x 20 deg image on an image intensifier which is coupled to a CCD array image detector by means of fiber optics. The line of sight of the instrument is perpendicular to the spin axis, and consequently the image of a fixed point on the earth moves across the detector at a rate depending on the spin period. The signal charges on a CCD imager are normally read out by shifting rows of charges until they reach the edge of the detector. In this instrument, the clock rate which determines the movement of the charges is adjusted so that the motion remains in step with the movement of the image. In this way an exposure time of about 1 s can be attained despite the rotation of the spacecraft. Two almost identical cameras are used. One has a calcium fluoride filter with a potassium bromide photo-cathode which results in a pass band from 1250 to approximately 1600 A. For the other, the outer filter is barium fluoride and the photo-cathode is of cesium iodide, which together gives a pass band from 1350 to 1900 A. Exposure sequence control, data transfer to telemetry, and housekeeping functions are carried out by a special purpose bit-slice microcomputer. The electronics are designed to provide complete flexibility as to the size and shape of the telemetered image, and the type of averaging carried out on the pixels during readout, so that the optimum choice can be made as to image size, spectral resolution, and temporal resolution in using the available telemetry bandwidth at a particular time. Control of the exposure time and sequencing is done entirely through clocking the CCD array, using reference pulses from the earth-limb sensor on the spacecraft. No mechanical shutter is employed.

------- VIKING SWEDEN, BAHNSEN---------------------------------

INVESTIGATION NAME- HIGH FREQUENCY WAVE EXPERIMENT

NSSDC ID- VIKING -02

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
ATMOSPHERIC PHYSICS
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - A.	BAHNSEN	DANISH SPACE RES INST
CI - M.	JESPERSEN	DANISH SPACE RES INST
CI - E.	UNGSTRUP	DANISH SPACE RES INST
CI - B.	HOLBACK	UPPSALA IONOSPHER OBS
CI - R.E.	GENDRIN	CNET
CI - R.	BOSTROM	UPPSALA IONOSPHER OBS

BRIEF DESCRIPTION

The wave instrument (V4) is divided into two parts, one for high frequencies (V4H) and one for low (V4L). Although the investigation is divided into two parts, these are closely related as many components of the instrument are common, such as sensors, the micro-processor, differential amplifiers, etc. The objectives of this investigation are to gather information about plasma instabilities and wave-particle interactions, and to measure the plasma density and electron temperature. V4H measures simultaneously the amplitudes of one electric (Ey or Ez) and one magnetic (Bx) field component as functions of frequency in the range 4 to 500 kHz. It is possible to switch between Ey and Ez up to 15 times per spin, thus providing measurements in two orthogonal directions, but this comparative measurement is limited to frequencies below 128 kHz, as the Ez sensor has this frequency limitation. The magnetic field sensor is an air-core loop antenna with an area of 0.1 sq m, mounted on a 2-m boom with the loop axis parallel to the spacecraft spin axis, and it measures the spin-independent magnetic field component Bx. The field strengths are measured by two methods that operate in parallel. In one method the magnetic field sensor and the electric Ey field sensor are each connected to a filterbank having eight frequency channels, and all 16 filters are sampled within 37.5 ms. The other method employs a stepped-frequency analyzer (SFA) with two channels, one for the magnetic component and one for an electric component (Ey or Ez). In each channel the signal amplitude within the same narrow frequency band is measured. The band can be stepped through the whole or part of the range 10 to 500 kHz. The frequency stepping is controlled by the micro-processor. The whole range is covered in 256 steps, which takes 1.2 s in fast mode (one sample per step). Two "active" experiments, a resonance sounder and a mutual impedance measurement, will also be operated approximately 10% of the time. The resonance sounder operates by exciting the plasma (using two 38-m wire booms, 80 m tip-to-tip) with a strong alternating electric field at a frequency that is swept through the SFA frequency range. Resonances occur as the frequency sweep passes the characteristic plasma frequencies, resulting in strong signals on the electric sensors connected to the SFA. In this way the electron gyrofrequencies, plasma frequencies, and upper hybrid frequencies can be determined with good precision (a few percent). By coupling the signal to the discrete Fourier transform spectrum analyzer of V4L (VIKING -03) approximately 10 times higher precision is obtained. The mutual impedance measurement of the plasma density is performed by emitting a rather weak alternating current (using electrostatic probes on two 2-m booms) and measuring the voltage on the electric sensors. In particular, the electron plasma frequency appears as a large variation in the impedance around this frequency. The shape of the impedance variation may be analyzed in terms of the Debye length, giving information about the electron temperature. The measurement range for the electron density is 1 to 3000 per cc, and for the electron temperature 0.5 to 50 eV at apogee. The magnetic field threshold level is 8E-15 T per (Hz**0.5), and the electric field threshold level is 5E-8 V/m per (Hz**0.5).

------- VIKING SWEDEN, BLOCK-----------------------------------

INVESTIGATION NAME- VECTOR ELECTRIC FIELD EXPERIMENT

NSSDC ID- VIKING -04 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - L.P.	BLOCK	ROYAL INST OF TECH
CI - C.G.	FALTHAMMAR	ROYAL INST OF TECH
CI - F.S.	MOZER	U OF CALIF, BERKELEY
CI - A.	PEDERSEN	ESA-ESTEC

BRIEF DESCRIPTION

The purpose of this investigation (V1) is to measure the quasi-static electric field vector, and to use swept electric field probes for plasma density measurements. The instrument measures potential differences between probes on booms extending in different directions from the spacecraft. The probes do not normally assume the same potential as the surrounding plasma, but they can be operated in such a way that the probe-plasma potential drops are accurately accounted for, even when their exact values are unknown. The instrument is controlled by a micro-processor. There are two pairs of orthogonal radial probes, each pair consisting of a probe at the end of each of two 40-m wire booms (80 m tip-to-tip). These wire booms are extended in the spin plane and are kept straight by centrifugal force. Two 4-m stiff booms extending along the spin axis carry the two axial probes. Thus, there are three orthogonal probe pairs which measure three vector components. Each probe is a sphere of 10-cm diameter, and each has adjacent electrodes (guard, inner tip, and outer tip) to minimize measurement errors; the lengths of these electrodes are 50, 150, and 15 cm, respectively, for the radial probes. For the axial probes- all three electrodes are 10 cm long. The accuracy of the measurements depends critically on the probe guard and tip potentials relative to the surrounding plasma potential. For negative potential, probe current is essentially saturated to the photo-emission current carried by electrons leaving the probe; the plasma ion current is negligible in comparison. At several volts positive potentials there is again almost saturation current when all plasma electrons arriving in the vicinity are attracted and caught by the positive probe. The probes will be electronically biased, with currents that are as equal as possible, to an operating point on the probe characteristic which is midway between these two saturation regions, and where the dynamic conductance dI/dV is nearly maximum. To find the desired operating point, one probe will be subjected to a current pulse sweep with simultaneous measurement of the probe-satellite voltage for each pulse, so that the probe characteristic corresponding to the ambient plasma conditions is obtained. The bias current for the following electric field measurements will then be automatically kept at the operating point current until the next current pulse sweep is initiated. This sequence is called the Langmuir mode, and the electron temperature and density can be calculated from the probe characteristic. The electron density is measured with better time resolution by the V4L experiment (VIKING -03) than by this experiment. Therefore, this experiment mode is normally employed only once every few minutes, or even less frequently. The whole sequence of current pulses takes a few hundred milliseconds. During the strongest current pulses, when plasma electron saturation current is obtained, the satellite potential will be driven to perhaps 10 to 50 V negative. That will cause some easily identifiable disturbances for the low energy particle experiments. Each electric field component in the spin plane can be measured in the range 0.05 to 400 mV/m, with resolution of 0.2 mV/m for fields stronger than 50 mV/m and 0.025 mV/m for weaker fields. For the axial component, the range is 0.5 to 4000 mV/m, with resolution of 2 mV/m for fields stronger than 500 mV/m, and 0.25 mV/m for weaker fields. The sampling rate for each of the components is 53 Hz in normal mode and 106 Hz in fast mode. The probes are shared with the V4 instrument (VIKING -02 and -03), which will process the ac signals with frequencies greater than 1 Hz. The V1 dc and V4 ac measurements can be made simultaneously, but when V4 is using one of the radial probes for electron density measurements it cannot then be used for electric field measurements.

------- VIKING SWEDEN, GUSTAFSSON-----------------------------

INVESTIGATION NAME- LOW FREQUENCY WAVE EXPERIMENT

NSSDC ID- VIKING -03 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - G.	GUSTAFSSON	UPPSALA IONOSPHER OBS
CI - B.	HOLBACK	UPPSALA IONOSPHER OBS
CI - R.	BOSTROM	UPPSALA IONOSPHER OBS
CI - G.	HOLMGREN	UPPSALA IONOSPHER OBS
CI - H.	KOSKINEN	UPPSALA IONOSPHER OBS
CI - A.	BAHNSEN	DANISH SPACE RES INST
CI - M.	JESPERSEN	DANISH SPACE RES INST
CI - E.	UNGSTRUP	DANISH SPACE RES INST
CI - M.C.	KELLEY	CORNELL U
CI - P.M.	KINTNER	CORNELL U
CI - A.	PEDERSEN	ESA-ESTEC

BRIEF DESCRIPTION

The wave instrument (V4) is divided into two parts, one for high frequencies (V4H) and one for low (V4L). Although the investigation is divided into two parts, these are closely related as many components of the instrument are common, such as sensors, the micro-processor, differential amplifiers, etc. The objectives of this investigation are to gather information about plasma instabilities and wave-particle interactions, and to measure the plasma density and electron temperature. This part (V4L) of the investigation is designed to cover the frequency range 0 to 15 kHz. Two instruments are used, a wave analyzer and a plasma density instrument. The wave analyzer treats the data in three branches: (1) the discrete Fourier transform (DFT) analyzer, operating in the range 0 to 15.6 kHz, giving power spectra in 256 points; (2) the filterbank, with 3 broadband filters covering 200 Hz to 3.5 kHz which are sampled every telemetry frame (18.75 ms); and (3) the wave form (WF) branch for frequencies below 200 Hz, where two wave signals are sampled and transmitted with a bandwidth of 214 Hz or, alternatively, 428 Hz. The DFT performs power spectrum analysis of one wave signal at a time. There are six different signals that can be analyzed, and the selection is controlled by the experiment controller, which can be commanded from the ground. In a special mode the DFT is used to analyze the data from the stepped-frequency analyzer (SFA) part of V4H (VIKING -02). This is possible as the higher frequencies are first mixed to lower frequencies which fit the frequency range of the DFT. The spectrum analysis of the DFT then gives a factor of 10 better frequency resolution than what is achieved originally by the SFA. The plasma density instrument consists of two independent units with probes and electronics that can be operated separately or in parallel. The probes, which are mounted on two 40-m wire booms, are shared with the V1 instrument (VIKING -04). When operated in the density mode,

i.e., at low input impedance, the probes are biased positively and thus work on the saturation portion of the current-voltage probe characteristic. To avoid problems caused by a varying spacecraft potential, the bias voltage is referred to the electric field probes which are part of the V1 experiment (VIKING -04). The quantity of interest for the wave measurements is the relative fluctuation of the electron density. In addition to the relative current fluctuations, the dc level is measured, which is used to calculate the total plasma density. The data from the resonance sounder part of V4H (VIKING -02) will be used for calibration of the density probe measurement.

------- VIKING SWEDEN, LUNDIN----------------------------------

INVESTIGATION NAME- HOT PLASMA EXPERIMENT

NSSDC ID- VIKING -05 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - R.	LUNDIN	KIRUNA GEOPHYS INST
CI - B.K.G.	HULTQVIST	KIRUNA GEOPHYS INST
CI - L.	ELIASSON	KIRUNA GEOPHYS INST
CI - I.	SANDAHL	KIRUNA GEOPHYS INST
CI - F.	SORAAS	U OF BERGEN
CI - W.	STUDEMANN	MPI-AERONOMY
CI - B.	WILKEN	MPI-AERONOMY
CI - A.	KORTH	MPI-AERONOMY
CI - G.	KREMER	MPI-AERONOMY
CI - J.B.	BLAKE	AEROSPACE CORP
CI - J.F.	FENNELL	AEROSPACE CORP
CI - D.A.	BRYANT	RUTHERFORD APPLETON L.
CI - D.S.	HALL	RUTHERFORD APPLETON L.
CI - T.A.	FRITZ	LOS ALAMOS NAT LAB
CI - D.J.	WILLIAMS	APPLIED PHYSICS LAB
CI - J.B.	REAGAN	LOCKHEED PALO ALTO
CI - R.D.	SHARP	LOCKHEED PALO ALTO

BRIEF DESCRIPTION

The objectives of this investigation (V3) are (1) to study the magnetic field-aligned acceleration mechanisms associated with discrete auroral (2) to measure the energy input and output from the ionosphere due to charged particles; (3) to identify the charge carriers in the field-aligned (Birkeland) currents; (4) to study the escape processes for upward flowing ion events and their ionospheric implications; (5) to study the bulk motion, including convection, of low energy ions (1 eV to 10 keV); (6) to study the solar wind versus the ionospheric contribution to the hot magnetospheric plasma during various magnetospheric disturbance levels; and (7) to study various morphological features of the hot magnetospheric plasma. This large plasma experiment, utilizing seven sensor units, is subdivided into three parts: the low energy particle spectrometers (LEPS), the ion composition spectrometers (ICS), and the high energy magnetospheric ion composition spectrometers (MICS/V). The LEPS measures (1) the energy spectrum of electrons from 10 eV to 40 keV with (delta E)/E of 0.05; (2) the pitch angle distribution of electrons from 0.1 to 300 keV with 2-deg resolution; (3) the energy spectrum and pitch angle distribution of positive ions in the range 40 eV to 40 keV with (delta E)/E <0.08 and angular resolution of 6 deg; and (4) the three-dimensional distribution function of positive ions from 1 eV to 10 keV for determining possible directional flow velocities as low as 1 km/s. For the LEPS units, eight spectrometers are used, with channeltrons, (or channelplates) as sensor elements. The ICS fulfills these main functions: (1) provides detailed composition measurements of positive ions in the energy range 0.01 to 70 keV/Q and mass per unit charge range 0.7 to 150 u/Q; (2) identifies and separates the minor constituents 3He++, 16O 6+, and 16O+++ from the major constituents H+, 4He++, 4He+, and 16O+ in the energy range 0.01 to 15 keV; (3) provides complete mass separation of the major constituents up to 70 keV; and (4) provides pitch angle and energy distribution function measurements of the major ion constituents H+, 4He++, 4He+, and O+, in the energy range 50 eV to 20 keV within half a spin period. Three spectrometers are used for the ICS measurements, all with toroidal-shaped electrostatic analyzers placed in front of crossed field velocity analyzers. The MICS/V fulfills the following functions. (1) determines the composition of magnetospheric ions over the energy range from 10 keV/Q to 10 MeV/Q and mass range 1 to 56 u; (2) identifies and separates most of the "rare" magnetospheric ions constituents including isotopic identification of 3He and 4He; (3) makes separate carbon, nitrogen, and oxygen measurements at various charge states within the given energy range; and (4) provides pitch angle and energy distribution function measurements of the major ion constituents in the energy range 10 keV to 10 MeV within half a spin period. This instrument combines an electrostatic analyzer (ESA), time-of-flight (TOF) measurement, residual energy sensors (solid state detectors), and a heavy ion telescope (HIT). The ESA/TOF goes up to 300 keV/Q, and the HIT provides composition measurements of positive ions from 400 keV/nucleon to 10 MeV/nucleon using a dE/dx vs E measuring technique. The field of view of the ESA/TOF is 2 x 2 deg, and that of the HIT is 20 deg, FWHM. Cycle times are 1.2 to 4.8 s for the ESA/TOF and 0.6 s for the HIT.

------- VIKING SWEDEN, POTEMRA----------------------------------

INVESTIGATION NAME- MAGNETIC FIELD EXPERIMENT

NSSDC ID- VIKING -06 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - T.A.	POTEMRA	APPLIED PHYSICS LAB
CI - R.	BOSTROM	UPPSALA IONOSPHER OBS
CI - G.	GUSTAFSSON	UPPSALA IONOSPHER OBS
CI - M.H.	ACUNA	NASA-GSFC
CI - D.P.	STERN	NASA-GSFC
CI - M.	SUGIURA	NASA-GSFC
CI - L.	ZANETTI	APPLIED PHYSICS LAB
CI - A.	BYTHROW	APPLIED PHYSICS LAB

BRIEF DESCRIPTION

The objectives of this investigation are to measure the characteristics of field-aligned (Birkeland) currents, to measure plasma waves and turbulence, to identify localized instabilities and plasma processes, and to provide the local magnetic field reference frame for other experiments on board. The instrument is a single wide-range triaxial fluxgate magnetometer, with the sensor mounted remotely from the spacecraft on a deployable boom. There are four dynamic ranges, which are switched automatically. The ranges (both positive and negative) and resolutions are 1024 nT with 0.125-nT resolution; 4096 nT with 0.5-nT resolution; 16384 nT with 2-nT resolution; and 65,536 nT with 8-nT resolution. The sampling rate is such that 53.3 complete vector samples are obtained per second. ULF waves with frequencies up to 26 Hz are also measured.

*************************** X-RAY TIMING EXPLORER*************

SPACECRAFT COMMON NAME- X-RAY TIMING EXPLORER
ALTERNATE NAMES- XTE

NSSDC ID- XTE

LAUNCH DATE- 09/00/89 WEIGHT- KG
LAUNCH SITE- KENNEDY SPACE CENTER, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 92.6 MIN INCLINATION- 28.5 DEG
PERIAPSIS- 409. KM ALT APOAPSIS- 409. KM ALT

PERSONNEL

MG - D.	WRUBLIK	NASA HEADQUARTERS
SC - L.	KALUZIENSKI	NASA HEADQUARTERS
PM - W.D.	HIBBARD	NASA-GSFC
PS - S.S.	HOLT	NASA-GSFC

BRIEF DESCRIPTION

X-ray Timing Explorer (XTE) is an Explorer S/C planned to carry three X-ray instruments into orbit to make observations of variable stellar X-ray sources. Emissions in the range 1? to 200 keV are observed with time scales of microseconds to years. The S/C can point a large area proportional counter (LAPC) and a high-energy X-ray timing experiment (HEXTE) at any desired target to an accuracy of 0.1 deg. In addition, an all-sky monitor (ASM) observes the entire sky once per orbit to provide near-continuous observations of all sources and to alert the narrow field instruments to fortuitous transient X-ray phenomena.

------- X-RAY TIMING EXPLORER, BRADT----------------------------

INVESTIGATION NAME- X-RAY SKY MONITOR

NSSDC ID- XTE -01 INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
HIGH ENERGY ASTROPHYSICS
X-RAY ASTRONOMY

PERSONNEL

PI - H.V.	BRADT	MASS INST OF TECH
PI - S.S.	HOLT	NASA-GSFC
OI - J.E.	MCCLINTOCK	MASS INST OF TECH
OI - C.R.	CANIZARES	MASS INST OF TECH
OI - J.H.	SWANK	NASA-GSFC
OI - F.E.	MARSHALL	NASA-GSFC

BRIEF DESCRIPTION

The All-Sky Monitor (ASM) provides all-sky X-ray coverage, to a sensitivity of a few percent of the Crab Nebula intensity in one day, in order to provide both flare alarms and long-term intensity records of celestial X-ray sources.

C - 3

------- X-RAY TIMING EXPLORER, HOLT----------------------------

INVESTIGATION NAME- LARGE AREA X-RAY PROPORTIONAL COUNTER

NSSDC ID- XTE -02

INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
HIGH ENERGY ASTROPHYSICS
X-RAY ASTRONOMY

PERSONNEL

PI - S.S.	HOLT	NASA-GSFC
PI - H.V.	BRADT	MASS INST OF TECH
OI - J.H.	SWANK	NASA-GSFC
OI - F.E.	MARSHALL	NASA-GSFC
OI - C.R.	CANIZARES	MASS INST OF TECH
OI - J.E.	MCCLINTOCK	MASS INST OF TECH

BRIEF DESCRIPTION

The Large Area X-ray Proportional Counter (LAPC) provides approximately 1 sq m of net X-ray detector area, in the energy range 2 to 60 keV, for the study of temporal/spectral effects in the X-ray emission from galactic and extragalactic sources.

------- X-RAY TIMING EXPLORER, ROTHSCHILD----------------------

INVESTIGATION NAME- HIGH-ENERGY X-RAY TIMING EXPERIMENT (HEXTE)

NSSDC ID- XTE -03

INVESTIGATIVE PROGRAM
CODE EZ

INVESTIGATION DISCIPLINE(S)
HIGH ENERGY ASTROPHYSICS
X-RAY ASTRONOMY

PERSONNEL

PI - R.E.	ROTHSCHILD	U OF CALIF, SAN DIEGO
OI - R.M.	PELLING	U OF CALIF, SAN DIEGO
OI - D.E.	GRUBER	U OF CALIF, SAN DIEGO
OI - J.L.	MATTESON	U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION

The High-Energy X-ray Timing Experiment (HEXTE) is a scintillator array for the study of temporal and temporal/spectral effects of the hard X-ray (20 to 200 keV) emission from galactic and extragalactic sources.

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INDEX OF ACTIVE AND PLANNED SPACECRAFT AND EXPERIMENTS

4. INDEX OF ACTIVE AND PLANNED SPACECRAFT AND EXPERIMENTS

This index contains the names of all the spacecraft (including both free-flying spacecraft and Shuttle-attached payloads) and their experiments that were either active sometime between June 1, 1983, and September 30, 1984 or later, or planned as of approximately September 30, 1984. The spacecraft are listed alphabetically by both common name and alternate names. The alternate names are printed with a reference to the NSSDC spacecraft common name. Next to the NSSDC spacecraft common name are the sponsoring country and agency, actual or projected launch date, orbit type, NSSDC ID code, the current status of the spacecraft, and the page number which specifies where the description of the spacecraft may be found.

The current status includes the epoch date, operating status, and received data-rate status of each launched spacecraft and experiment. The entry is based, to a large extent, on status information from the project office through September 30, 1984. The epoch date indicates when a particular spacecraft experiment operating status and received data-rate status were reached. Shuttle-attached payload experiments which operated in a normal manner and returned to earth with the Shuttle sometime between June 1, 1983, and September 30, 1984, are given a status of "Returned to Earth," while Shuttle-attached payload experiments which did not operate in the normal manner are given other appropriate status indicators. Some experiments may be included in this publication which have a status of inoperable with an epoch data earlier than June 1, 1983, because this status information was not known by NSSDC when the last report was published. For prelaunch spacecraft, only the overall mission status is shown. There is no status information shown for prelaunch spacecraft experiments. Definitions of the terms used in the status information columns may be found in Appendix C.

The experiments are listed following the associated spacecraft common name, and are ordered alphabetically by the last name of the Principal Investigator, Lead Investigator, or Team Leader. The experiment name, NSSDC ID code, and current status are also given for each experiment. Finally, each name is followed by a page number which specifies where the description of the experiment may be found.

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1977-007A	UNITED STATES	DOD-USAF	02/06/77	GEOCENTRIC	77-007A	02/07/77	NORMAL	STND	11
HIGBIE	ENERGETIC PARTICLE DETECTOR				77-007A-01	11/00/78	PARTIAL	STND	11
1981-025A	UNITED STATES	DOD-USAF	03/16/81	GEOCENTRIC	81-025A	03/16/81	NORMAL	STND	11
HIGBIE	ENERGETIC PARTICLE DETECTOR				81-025A-01	05/00/81	NORMAL	STND	11
1982-019A	UNITED STATES	DOD-USAF	03/06/82	GEOCENTRIC	82-019A	03/06/82	NORMAL	STND	11
HIGBIE	ENERGETIC PARTICLE DETECTOR				82-019A-01	03/00/82	PARTIAL	STND	11
1984-037A	UNITED STATES	DOD-USAF	04/14/84		84-037A	05/00/84	NORMAL	STND	12
HIGBIE	ENERGETIC PARTICLE DETECTOR				84-037A-01	05/00/84	NORMAL	STND	12
AFP-675	UNITED STATES	DOD-USAF		GEOCENTRIC	AFP-675				121
CARRUTHERS	FAR ULTRAVIOLET CAMERAS				AFP-675-02				121
FENIMORE	UNIFORMLY REDUNDANT ARRAY				AFP-675-03				121
LEBLANC	HORIZON ULTRAVIOLET PROGRAM				AFP-675-05				121
O'NEIL	CRYOGENIC INFRARED RADIANCE INSTRUMENTATION FOR SHUTTLE				AFP-675-01				121
RESTER	GAMMA RAY ADVANCED DETECTOR				AFP-675-04				121
TRZCINSKI	QUADRUPOLE ION NEUTRAL MASS SPECTROGRAPH				AFP-675-06				122
AFP-888	UNITED STATES	DOD-USAF		GEOCENTRIC	AFP-888		APPROVED MISSION		122
BOWYER	EXTREME ULTRAVIOLET PHOTOMETER				AFP-888-03				122
POWER	ION AUXILIARY PROPULSION SYSTEM				AFP-888-02				122
QUELLE	STELLAR HORIZON ATMOSPHERIC DISPERSION EXPERIMENT				AFP-888-04				122
STEARS	TEAL RUBY				AFP-888-01				122
AIR FORCE PROJECT-675	SEE AFP-675								
AIR FORCE PROJECT-888	SEE AFP-888								
AMPTE/CCE	UNITED STATES	NASA-OSSA	08/16/84	GEOCENTRIC	84-088A	08/16/84	NORMAL	STND	12
GLOECKLER	CHARGE-ENERGY-MASS SPECTROMETER(CHEM)				84-088A-03	08/16/84	NORMAL	STND	12
MCENTIRE	MEDIUM ENERGY PARTICLE ANALYZER (MEPA)				84-088A-02	08/16/84	NORMAL	STND	12
POTEMRA	CCE MAGNETOMETER (MAG)				84-088A-05	08/16/84	NORMAL	STND	12
SCARF	PLASMA WAVE EXPERIMENT (PWE)				84-088A-04	08/16/84	NORMAL	STND	13
SHELLEY	HOT PLASMA COMPOSITION EXPERIMENT (HPCE)				84-088A-01	08/16/84	NORMAL	STND	13
AMPTE/CHARGE COMP EXPL	SEE AMPTE/CCE								
AMPTE/ION RELEASE MODULE	SEE AMPTE/IRM								
AMPTE/IRM	FED REP OF GERMANY	BMFT	08/16/84	GEOCENTRIC	84-088B	08/16/84	NORMAL	STND	13
HAUSLER	PLASMA WAVE SPECTROMETER				84-088B-04	08/16/84	NORMAL	STND	13
HOVESTADT	SUPRATHERMAL IONS, CHARGE ANALYZER (SULEICA)				84-088B-06	08/16/84	NORMAL	STND	13
LUEHR	MAGNETOMETER				84-088B-02	08/16/84	NORMAL	STND	13
PASCHMANN	3-D PLASMA ANALYZER				84-088B-03	08/16/84	NORMAL	STND	14
ROSENBAUER	MASS SEPARATING ION SENSOR (MSIS)				84-088B-05	08/16/84	NORMAL	STND	14
VALENZUELA	ION RELEASE EXPERIMENT				84-088B-01	08/16/84	NORMAL	STND	14
AMPTE/UKS	UNITED KINGDOM	SERC	08/16/84	GEOCENTRIC	84-088C	01/15/85	INOPERABLE	ZERO	14
GOUGH	PARTICLE MODULATION ANALYZER				84-088C-01	01/15/85	NORMAL	ZERO	14
HALL	3-D ELECTRON ANALYZER				84-088C-02	01/15/85	NORMAL	ZERO	14
JOHNSTONE	THREE-DIMENSIONAL ION ANALYZER				84-088C-03	01/15/85	NORMAL	ZERO	15
SOUTHWOOD	MAGNETOMETER				84-088C-04	01/15/85	NORMAL	ZERO	15
WOOLLISCROFT	PLASMA WAVE SPECTROMETER				84-088C-05	01/15/85	NORMAL	ZERO	15
ARCAD 3	SEE AUREOL 3								
ASTRO-1	SEE ASTRO-X								
ASTRO-2	SEE ASTRO-X								
ASTRO-3	SEE ASTRO-X								
ASTRO-A	SEE HINOTORI								
ASTRO-B	SEE TENMA								
ASTRO-C	JAPAN	ISAS	00/00/87		ASTRO-C		APPROVED MISSION		122
MIYAMOTO	ALL SKY X-RAY MONITOR (ASM)				ASTRO-C-02				123
NISHIMURA	GAMMA-RAY BURST DETECTOR				ASTRO-C-03				123
TANAKA	LARGE AREA PROPORTIONAL COUNTERS (LAC)				ASTRO-C-01				123
ASTRO-X	UNITED STATES	NASA-OSSA		GEOCENTRIC	ASTRO		APPROVED MISSION		123
CODE	WISCONSIN ULTRAVIOLET PHOTOPOLARIMETRY EXPERIMENT (WUPPE)				ASTRO -01				123
DAVIDSEN	HOPKINS ULTRAVIOLET TELESCOPE (HUT)				ASTRO -02				123
STECHER	ULTRAVIOLET IMAGING TELESCOPE (UIT)				ASTRO -03				124
ASTRON	U.S.S.R.	SAS	03/23/83	GEOCENTRIC	83-020A				15
BOYARCHUK	X-RAY SPECTROMETERS				83-020A-02				15
SEVERNY	ULTRAVIOLET TELESCOPE				83-020A-01				15

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ASTRONOMICAL SATELLITE-A	SEE HINOTORI								
AUREOL 3	U.S.S.R.	SAS	09/21/81	GEOCENTRIC	81-094A	09/21/81	NORMAL	STND	15
BEGHIN	ISOPROBE (RADIO-FREQUENCY PROBE)				81-094A-08	09/00/81	NORMAL	STND	16
BERTHELIER	ION MASS SPECTROMETER (DYCTION)				81-094A-07	09/00/81	NORMAL	STND	16
BERTHELIER	ISO F (ELECTRIC FIELD PROBE)				81-094A-09	09/00/81	NORMAL	STND	16
BERTHELIER	TRAC (FLUXGATE MAGNETOMETER)				81-094A-11	09/00/81	NORMAL	STND	16
BOSQUED	TBE SOFT PARTICLE SPECTROMETERS				81-094A-04	09/00/81	NORMAL	STND	16
BOSQUED	ROBE SOFT PARTICLE SPECTROMETER				81-094A-05	09/00/81	NORMAL	STND	15
BOSQUED	ENERGETIC SPECTROMETER (ION)				81-094A-06	09/00/81	NORMAL	STND	17
GALPERIN	KUKUSHKA SOFT PARTICLE SPECTROMETER				81-094A-01	12/00/83	NORMAL	ZERO	17
GALPERIN	PIETSTCHANKA PARTICLE SPECTROMETER				81-094A-02	12/00/83	NORMAL	ZERO	17
GALPERIN	FON ENERGETIC PARTICLE DETECTOR				81-094A-03	12/00/83	NORMAL	ZERO	17
GLASYSHEV	ALTAIR (AURORAL PHOTOMETRY)				81-094A-12	12/00/83	NORMAL	ZERO	17
LEFEUVRE	ISO M (MAGNETIC FIELD PROBE)				81-094A-10	09/00/81	NORMAL	STND	17
AUREOLE 3	SEE AUREOL 3								
AUTOMATIC STATION ASTRON	SEE ASTRON								
BEACON EXP&AURORAL RESCH	SEE POLAR BEAR								
BERKSAT	SEE EUVE								
BHASKARA	INDIA	ISRO	06/07/79	GEOCENTRIC	79-051A	06/07/79	NORMAL	STND	17
	U.S.S.R.	INTERCOS							
CALLA	SATELLITE MICROWAVE RADIOMETER (SAMIR)				79-051A-01	06/12/79	NORMAL	STND	17
BHASKARA 2	INDIA	ISRO	11/20/81	GEOCENTRIC	81-115A	11/00/81	NORMAL	STND	18
BHANDARI	THERMAL CONTROL COATINC				81-115A-04	11/00/81	NORMAL	STND	18
CALLA	SATELLITE MICROWAVE RADIOMETER (SAMIR)				81-115A-02	11/00/81	NORMAL	STND	18
JOSEPH	DUAL TV CAMERA				81-115A-01	11/00/81	PARTIAL	STND	18
KAMAT	DATA COLLECTION PLATFORM				81-115A-05	11/00/81	NORMAL	STND	18
MATHUR	SOLAR CELL				81-115A-03	11/00/81	NORMAL	STND	18
CCE	SEE AMPTE/CCE								
CHARGE COMPOSITION EXPL	SEE AMPTE/CCE								
CHEM RELEASE+RAD EFF SAT	SEE CRRES								
CIRRIS 1A	SEE AFP-675								
COBE	UNITED STATES	NASA-OSSA	12/00/87	GEOCENTRIC	COBE		APPROVED MISSION		124
HAUSER	DIFFUSE INFRARED BACKGROUND EXPERIMENT (DIRBE)				COBE -02				124
MATHER	FAR INFRARED ABSOLUTE SPECTROPHOTOMETER (FIRAS)				COBE -01				124
SMOOT	DIFFERENTIAL MICROWAVE RADIOMETERS (DMR)				COBE -03				125
CORSA-B	SEE HAKUCHO								
COSMIC BACKGROUND EXPL	SEE COBE								
COSMIC RADIATION SAT B	SEE HAKUCHO								
CRRES	UNITED STATES	NASA-OSSA	07/00/87	GEOCENTRIC	CRRES		APPROVED MISSION		125
	UNITED STATES	DOD-USAF							
	UNITED STATES	DOD-NAVY							
ANDERSON	SEARCH COIL MAGNETOMETER (AFGL 701-13)				CRRES -20				125
ANDERSON	PASSIVE PLASMA SOUNDER (PPS) (AFGL 701-15)				CRRES -22				125
BLAKE	OMNI PROTON TELEMETRY ALLOCATION SWITCH (AFGL-701-7B)				CRRES -14				125
BURKE	LANGMUIR PROBE (AFGL 701-14)				CRRES -21				126
FRITZ	MEDIUM ENERGY ION COMPOSITION (AFGL 701-11A)				CRRES -16				126
FRITZ	LOW ENERGY ION COMPOSITION (AFGL-T01-11B)				CRRES -17				125
FRITZ	HEAVY ION TELESCOPE (AFGL 701-11C)				CRRES -18				126
HARDY	THE SPACE RADIATION DOSIMETER (AFGL-701)				CRRES -07				126
HARDY	HIGH-ENERGY ELECTRON FLUXMETER (HEEF) (AFGL-701-4)				CRRES -09				127
HARDY	LOW-ENERGY PLASMA ANALYZER (LEPA) (AFGL-701-6)				CRRES -12				127
HEPPNER	CHEMICAL RELEASE EXPERIMENTS				CRRES -06				127
IMHOF	SPECTROMETER FOR ELECTRONS AND PROTONS (SEP) (ONR-307-3)				CRRES -03				127
KOLASINSKI	RELATIVISTIC PROTON TIME-OF-FLIGHT DETECTOR (AFGL-701-7A)				CRRES -13				127
KORTH	ELECTRON-PROTON-ANGLE-SPECTROMETER (EPAS) (AFGL-701-5B)				CRRES -11				128
QUINN	LONG ENERGY ION MASS SPECTROMETER (ONR-307-8A)				CRRES -23				128
RICH	THE FLUXGATE MAGNETOMETER (AFGL-701)				CRRES -19				128

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RIEHL	PROTON TELESCOPE (PROTEL) (AFGL-701-8 & 9)			CRRES -15				128
RITTER	THE SPACERAD MICROELECTRONICS EXPERIMENT (AFGL-701)			CRRES -02				128
RITTER	THE METAL OXIDE SEMICONDUCTOR DOSIMETER (AFGL-701)			CRRES -08				129
ROBINSON	THE INTERNAL DISCHARGE MONITOR (AGL-701)			CRRES -05				129
SIMPSON	HIGH ENERGY HEAVY NUCLEI COMPOSITION (ONR-604)			CRRES -01				129
TRUMBLE	GALLIUM ARSENIDE SOLAR CELL PANEL EXPERIMENT (AFAPL-801)			CRRES -04				129
VAMPOLA	MEDIUM-ENERGY ELECTRON SPECTROMETER (AFGL-701-5A)			CRRES -10				129
VOSS	MEDIUM ENERGY ION MASS SPECTROMETER (ONR 307-8B)			CRRES -24				130
DAUGHTER	SEE ISEE 2							
DE 1	SEE DYNAMICS EXPLORER 1							
DE-A	SEE DYNAMICS EXPLORER 1							
DMSP 5D-2/F6	UNITED STATES DOD-USAF	12/21/82	GEOCENTRIC	82-118A	12/21/82	NORMAL	STND	18
AFGWC STAFF	OPERATIONAL LINESCAN SYSTEM (OLS)			82-118A-01	12/25/82	NORMAL	STND	19
KOLASINSKI	SCANNING X-RAY SPECTROMETER (SSB/A)			82-118A-03	12/24/82	NORMAL	STND	19
ROTHWELL	PRECIPITATING ELECTRON/ION SPECTROMETER (SSJ/4)			82-118A-05	12/28/82	NORMAL	STND	19
SAGALYN	IONOSPHERIC PLASMA MONITOR (SSI/E)			82-118A-04	08/04/83	INOPERABLE	ZERO	19
DMSP 5D-2/F7	UNITED STATES DOD-USAF	11/18/83	GEOCENTRIC	83-113A	11/29/83	NORMAL	STND	19
AFGWC STAFF	OPERATIONAL LINESCAN SYSTEM (OLS)			83-113A-01	11/29/83	NORMAL	STND	20
AFGWC STAFF	MICROWAVE TEMPERATURE SOUNDER (SSM/T)			83-113A-03	11/29/83	NORMAL	STND	20
AFGWC STAFF	SPACE RADIATION DOSIMETER (SSJ*)			83-113A-07	11/29/83	NORMAL	STND	20
ROTHWELL	PRECIPITATING ELECTRON/ION SPECTROMETER (SSJ/4)			83-113A-05	11/29/83	NORMAL	STND	20
SAGALYN	IONOSPHERIC PLASMA MONITOR (SSI/E)			83-113A-04	11/29/83	NORMAL	STND	20
SAGALYN	MAGNETOMETER (SSM)			83-113A-06	11/29/83	NORMAL	STND	20
SHRUM	X-RAY DETECTOR (SSB/S)			83-113A-08	11/29/83	NORMAL	STND	20
DMSP 5D-2/S10	SEE DMSP 5D-2/SX							
DMSP 5D-2/S11	SEE DMSP 5D-2/SX							
DMSP 5D-2/S12	SEE DMSP 5D-2/SX							
DMSP 5D-2/S13	SEE DMSP 5D-2/SX							
DMSP 5D-2/S14	SEE DMSP 5D-2/SX							
DMSP 5D-2/S6	SEE DMSP 5D-2/F6							
DMSP 5D-2/S7	SEE DMSP 5D-2/F7							
DMSP 5D-2/S8	SEE DMSP 5D-2/SX							
DMSP 5D-2/S9	SEE DMSP 5D-2/SX							
DMSP 5D-2/SX	UNITED STATES DOD-USAF		GEOCENTRIC	DMSP-SX				130
AFGWC STAFF	OPERATIONAL LINESCAN SYSTEM (OLS)			DMSP-SX-01				130
AFGWC STAFF	MICROWAVE IMAGER (SSM/I)			DMSP-SX-02				130
AFGWC STAFF	MICROWAVE TEMPERATURE SOUNDER (SSM/T)			DMSP-SX-05				130
AFGWC STAFF	MAGNETOMETER (SSM)			DMSP-SX-06				131
AFGWC STAFF	INFRARED TEMPERATURE AND MOISTURE SOUNDER (SSH-2)			DMSP-SX-07				131
HENDEL	ADVANCED X-RAY DETECTOR (SSB/X)			DMSP-SX-08				131
ROTHWELL	PRECIPITATING ELECTRON/ION SPECTROMETER (SSJ/4)			DMSP-SX-04				131
SAGALYN	IONOSPHERIC PLASMA SCINTILLATION MONITOR (SSI/ES)			DMSP-SX-03				131
DMSP BLOCK 5D-2	SEE DMSP 5D-2/F6							
DMSP BLOCK 5D-2	SEE DMSP 5D-2/F7							
DMSP BLOCK 5D-2	SEE DMSP 5D-2/SX							
DMSP-F6	SEE DMSP 5D-2/F6							
DMSP-F7	SEE DMSP 5D-2/F7							
DYNAMICS EXPLORER 1	UNITED STATES NASA-OSSA	08/03/81	GEOCENTRIC	81-070A	08/03/81	NORMAL	STND	21
CHAPPELL	RETARDING ION MASS SPECTROMETER			81-070A-04	08/09/81	PARTIAL	STND	21
FRANK	GLOBAL AURORAL IMAGING AT VISIBLE AND ULTRAVIOLET WAVELENGTHS			81-070A-03	09/14/81	NORMAL	STND	21
HELLIWELL	CONTROLLED AND NATURALLY OCCURRING WAVE PARTICLE INTERACTIONS			81-070A-08	08/03/81	NA	NA	21

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MAGGS	AURORAL PHYSICS				81-070A-07	08/03/81	NA	NA	22
SHAWHAN	PLASMA WAVES				81-070A-02	09/13/81	NORMAL	STND	22
SHELLEY	HOT PLASMA COMPOSITION				81-070A-06	08/13/81	NORMAL	STND	22
SUGIURA	MAGNETIC FIELD OBSERVATIONS				81-070A-01	08/24/81	NORMAL	STND	22
DYNAMICS EXPLORER-A	SEE DYNAMICS EXPLORER 1								
EARTH OBSERV. MISSION 1	SEE EOM-A								
EARTH RAD BUDGET SAT	SEE ERBS								
EARTH RES TECH SAT.-B	SEE LANDSAT 2								
EARTH RES TECH SAT.-C	SEE LANDSAT 3								
EML	SEE ISTP/EQUATOR								
EOM-1	SEE EOM-A								
EOM-A	UNITED STATES	NASA-OSSA IASB CNES DFVLR ISAS	11/00/85	GEOCENTRIC	EOM-A		APPROVED MISSION		131
ACKERMAN	GRILLE SPECTROMETER				EOM-A -01				132
BOWYER	FAR UV ASTRONOMY USING THE FAUST TELESCOPE				EOM-A -02				132
CROMMELYNCK	ABSOLUTE MEASUREMENT OF THE SOLAR CONSTANT				EOM-A -03				132
LANGNER	METRIC CAMERA EXPERIMENT				EOM-A -06				132
MENDE	ATMOSPHERIC EMISSION PHOTOMETRIC IMAGING				EOM-A -04				132
OBAYASHI	SPACE EXPERIMENTS WITH PARTICLE ACCELERATORS (SEPAC)				EOM-A -05				132
THUILLIER	MEASUREMENT OF THE SOLAR SPECTRUM FROM 170 TO 3200 NANOMETERS				EOM-A -07				133
TORR	AN IMAGING SPECTROMETRIC OBSERVATORY				EOM-A -08				133
WILLSON	ACTIVE CAVITY RADIOMETER SOLAR IRRADIANCE MONITOR				EOM-A -09				133
EQ. MAGNETOSPHERE LAB.	SEE ISTP/EQUATOR								
ERBS	UNITED STATES	NASA-OSSA	10/05/84	GEOCENTRIC	84-108B	10/05/84	NORMAL	STND	23
COOPER	EARTH RADIATION BUDGET EXPERIMENT (ERBE)				84-108B-01	11/05/84	NORMAL	STND	23
MCCORMICK	STRATOSPHERIC AEROSOL AND GAS (SAGE)				84-108B-02	10/20/84	NORMAL	STND	23
ERBS-A	SEE ERBS								
ERTS-B	SEE LANDSAT 2								
ERTS-C	SEE LANDSAT 3								
ESA-GEOS 2	INTERNATIONAL	ESA	07/14/78	GEOCENTRIC	78-071A	08/01/78	NORMAL	STND	23
BEGHIN	WAVE FIELD IMPEDANCE				78-071A-11	06/30/82	INOPERABLE	ZERO	24
GEISS	LOW-ENERGY ION COMPOSITION				78-071A-03	02/00/83	NORMAL	SUBS	24
GENDRIN	MAGNETIC WAVE FIELDS				78-071A-06	02/00/83	NORMAL	ZERO	24
HULTQVIST	LOW-ENERGY ELECTRON AND PROTON PITCH ANGLE DISTRIBUTION				78-071A-04	02/00/83	NORMAL	ZERO	24
MARIANI	TRIAXIAL FLUXGATE MAGNETOMETER				78-071A-09	02/00/83	NORMAL	ZERO	25
MELZNER	DC ELECTRIC FIELD AND GRADIENT B ELECTRON BEAM DEFLECTION				78-071A-08	02/00/83	INOPERABLE	ZERO	25
PEDERSEN	DC FIELDS BY DOUBLE PROBE				78-071A-07	02/00/83	NORMAL	ZERO	25
PETIT	VLF PLASMA RESONANCES				78-071A-05	02/00/83	NORMAL	ZERO	25
UNGSTRUP	ELECTRIC WAVE FIELDS				78-071A-10	06/30/82	NORMAL	ZERO	25
WILKEN	ELECTRON AND PROTON PITCH ANGLE DISTRIBUTION				78-071A-01	02/00/83	NORMAL	SUBS	26
WRENN	THERMAL PLASMA FLOW				78-071A-02	02/00/83	NORMAL	ZERO	26
EUROPEAN X-RAY OBS SAT.	SEE EXOSAT								
EUVE	UNITED STATES	NASA-OSSA	02/00/89	GEOCENTRIC	EUVE		APPROVED MISSION		133
BOWYER	EXTREME ULTRAVIOLET FULL-SKY SURVEY				EUVE -01				133
EXOS-C	SEE OHZORA								
EXOSAT	INTERNATIONAL	ESA	05/26/83	GEOCENTRIC	83-051A	05/26/83	NORMAL	STND	26
HOYD	LOW-ENERGY X-RAY IMAGING TELESCOPES				83-051A-02	06/00/83	PARTIAL	STND	26
TAYLOR	GAS SCINTILLATION X-RAY SPECTROMETER				83-051A-03	05/26/83	NORMAL	STND	27
TRUEMPER	MEDIUM-ENERGY COSMIC X-RAY PACKAGE				83-051A-01	05/26/83	NORMAL	STND	27
EXOSPHERIC SAT. C	SEE OHZORA								
EXPLORER 50	SEE IMP-J								
EXTREME UV EXPLORER	SEE EUVE								
GALILEO	SEE GALILEO PROBE								

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STEPHANIDES	LASER TRACKING REFLECTOR				75-027A-04	04/09/75	NORMAL	STND	28
GEOS-C	SEE GEOS 3								
GEOSTATION.METEORO.SAT.2	SEE GMS 2								
GEOSTATION.METEOROL.SAT.	SEE GMS								
GERMAN X-RAY SATELLITE	SEE ROSAT								
GIOTTO	INTERNATIONAL	ESA	07/15/85	COMET RENDEZVOU	GIOTTO		APPROVED MISSION		140
BALSIGER	ION MASS SPECTROMETER (IMS)				GIOTTO -03				140
JOHNSTONE	COMETARY PLASMA ION MASS AND ENERGY PER CHARGE ANALYZERS				GIOTTO -05				140
KELLER	HALLEY NUCLEUS IMAGING (HMC)				GIOTTO -01				141
KISSEL	DUST IMPACT MASS SPECTROMETER (PIA)				GIOTTO -04				141
KRANKOWSKY	NEUTRAL MASS SPECTROMETER (NMS)				GIOTTO -02				141
LEVASSEUR-REGOURD	HALLEY OPTICAL PROBE (HOPE)				GIOTTO -09				141
MCDONNELL	DUST IMPACT DETECTOR (DID)				GIOTTO -08				141
MCKENNA-LAWLOR	ENERGETIC PARTICLES ONSET ADMONITOR (EPONA)				GIOTTO -10				142
NEUBAUER	MAGNETOMETER (MAG)				GIOTTO -07				142
REME	ELECTRON ESA AND POSITIVE ION CLUSTER COMPOSITION ANALYZER (RPA)				GIOTTO -06				142
GMS	JAPAN / UNITED STATES	NASDA / NASA-OSSA	07/14/77	GEOCENTRIC	77-065A	08/02/84	NORMAL	ZERO	28
JMA STAFF	VISIBLE AND INFRARED SPIN-SCAN RADIOMETER (VISSR)				77-065A-01	08/02/84	PARTIAL	ZERO	28
JMA STAFF	WEATHER COMMUNICATIONS FACILITY				77-065A-03	08/02/84	PARTIAL	ZERO	29
KOHNO	SPACE ENVIRONMENT MONITOR (SEM)				77-065A-02	08/02/84	PARTIAL	ZERO	29
GMS 2	JAPAN	NASDA	08/10/81	GEOCENTRIC	81-076A	12/10/84	NORMAL	SUBS	29
JMA STAFF	VISIBLE AND INFRARED SPIN-SCAN RADIOMETER (VISSR)				81-076A-01	12/10/84	INOPERABLE	ZERO	29
JMA STAFF	WEATHER COMMUNICATIONS FACILITY				81-076A-03	12/10/84	NORMAL	STND	29
KOHNO	SPACE ENVIRONMENT MONITOR (SEM)				81-076A-02	12/10/84	NORMAL	STND	29
GMS 3	JAPAN	NASDA	08/02/84	GEOCENTRIC	84-080A	12/10/84	NORMAL	STND	29
JMA STAFF	VISIBLE AND INFRARED SPIN-SPAN RADIOMETER (VISSR)				84-080A-01	12/10/84	NORMAL	STND	29
JMA STAFF	WEATHER COMMUNICATIONS FACILITY				84-080A-03	12/10/84	NORMAL	STND	30
KOHNO	SPACE ENVIRONMENT MONITOR (SEM)				84-080A-02	12/10/84	NORMAL	STND	30
GOES 1	UNITED STATES / UNITED STATES	NOAA-NESS / NASA-OSSA	10/16/75	GEOCENTRIC	75-100A	06/18/80	NORMAL	SUBS	30
LEINBACH	ENERGETIC PARTICLE MONITOR				75-100A-02	06/01/78	PARTIAL	ZERO	30
LEINBACH	SOLAR X-RAY MONITOR				75-100A-03	06/01/78	NORMAL	ZERO	30
LEINBACH	MAGNETIC FIELD MONITOR				75-100A-04	06/18/80	NORMAL	ZERO	30
NESDIS STAFF	VISIBLE INFRARED SPIN-SCAN RADIOMETER (VISSR)				75-100A-01	02/03/85	INOPERABLE	ZERO	31
NESDIS STAFF	DATA COLLECTION SYSTEM (DCS)				75-100A-05	10/31/84	PARTIAL	ZERO	31
GOES 2	UNITED STATES / UNITED STATES	NOAA-NESS / NASA-OSSA	06/16/77	GEOCENTRIC	77-048A	02/29/84	PARTIAL	STND	31
LEINBACH	ENERGETIC PARTICLE MONITOR				77-048A-02	07/20/77	NORMAL	STND	31
LEINBACH	SOLAR X-RAY MONITOR				77-048A-03	07/20/77	NORMAL	STND	31
LEINBACH	MAGNETIC FIELD MONITOR				77-048A-04	04/24/82	PARTIAL	SUBS	32
NESDIS STAFF	DATA COLLECTION SYSTEM (DCS)				77-048A-05	10/04/79	NORMAL	STND	32
GOES 3	UNITED STATES / UNITED STATES	NOAA-NESS / NASA-OSSA	06/16/78	GEOCENTRIC	78-062A	08/14/79	NORMAL	STND	32
LEINBACH	ENERGETIC PARTICLE MONITOR				78-062A-02	07/13/78	NORMAL	STND	32
LEINBACH	SOLAR X-RAY MONITOR				78-062A-03	06/00/79	PARTIAL	STND	32
LEINBACH	MAGNETIC FIELD MONITOR				78-062A-04	07/13/78	NORMAL	STND	32
NESDIS STAFF	DATA COLLECTION SYSTEM (DCS)				78-062A-05	07/13/78	NORMAL	STND	33
GOES 4	UNITED STATES / UNITED STATES	NOAA-NESS / NASA-OSSA	09/09/80	GEOCENTRIC	80-074A	09/10/80	NORMAL	STND	33
LEINBACH	ENERGETIC PARTICLE MONITOR				80-074A-02	12/15/80	PARTIAL	SUBS	33
LEINBACH	SOLAR X-RAY MONITOR				80-074A-03	09/10/80	NORMAL	STND	33
NESDIS STAFF	DATA COLLECTION SYSTEM (DCS)				80-074A-05	09/27/80	NORMAL	STND	33
GOES 5	UNITED STATES	NOAA-NESS	05/22/81	GEOCENTRIC	81-049A	08/05/81	NORMAL	STND	33
LEINBACH	ENERGETIC PARTICLE MONITOR				81-049A-02	11/05/82	INOPERABLE	ZERO	34
LEINBACH	SOLAR X-RAY MONITOR				81-049A-03	08/05/81	NORMAL	STND	34
LEINBACH	MAGNETIC FIELD MONITOR				81-049A-04	08/05/81	NORMAL	STND	34
NESDIS STAFF	VISIBLE INFRARED SPIN-SCAN RADIOMETER ATMOSPHERIC SOUNDER (VAS)				81-049A-01	07/30/84	INOPERABLE	ZERO	34
NESDIS STAFF	DATA COLLECTION SYSTEM (DCS)				81-049A-05	08/05/81	NORMAL	STND	34
GOES 6	UNITED STATES / UNITED STATES	NOAA-NESS / NASA-OSSA	04/28/83	GEOCENTRIC	83-041A	06/01/83	NORMAL	STND	35
LEINBACH	ENERGETIC PARTICLE MONITOR				83-041A-02	06/01/83	NORMAL	STND	35
LEINBACH	SOLAR X-RAY MONITOR				83-041A-03	06/01/83	NORMAL	STND	35
LEINBACH	MAGNETIC FIELD MONITOR				83-041A-04	06/01/83	NORMAL	STND	35

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NESDIS STAFF	VISIBLE INFRARED SPIN-SCAN RADIOMETER ATMOSPHERIC SOUNDER (VAS)				83-041A-01	09/21/84	PARTIAL	STND	35
NESDIS STAFF	DATA COLLECTION SYSTEM (DCS)				83-041A-05	06/01/83	NORMAL	STND	36
GOES-A	SEE GOES 1								
GOES-B	SEE GOES 2								
GOES-C	SEE GOES 3								
GOES-D	SEE GOES 4								
GOES-E	SEE GOES 5								
GOES-F	SEE GOES 6								
GOES-G	UNITED STATES	NOAA-NESS	03/00/86	GEOCENTRIC	GOES-G		APPROVED MISSION		142
	UNITED STATES	NASA-OSSA							
LEINBACH	ENERGETIC PARTICLE MONITOR				GOES-G -02				143
LEINBACH	SOLAR X-RAY MONITOR				GOES-G -03				143
LEINBACH	MAGNETIC FIELD MONITOR				GOES-G -04				143
NESDIS STAFF	VISIBLE INFRARED SPIN-SCAN RADIOMETER ATMOSPHERIC SOUNDER (VAS)				GOES-G -01				143
NESDIS STAFF	DATA COLLECTION SYSTEM				GOES-G -05				143
GOES-H	UNITED STATES	NOAA-NESS	08/00/86	GEOCENTRIC	GOES-H		APPROVED MISSION		144
	UNITED STATES	NASA-OSSA							
LEINBACH	ENERGETIC PARTICLE MONITOR				GOES-H -02				144
LEINBACH	SOLAR X-RAY MONITOR				GOES-H -03				144
LEINBACH	MAGNETIC FIELD MONITOR				GOES-H -04				144
NESDIS STAFF	VISIBLE INFRARED SPIN-SCAN RADIOMETER ATMOSPHERIC SOUNDER (VAS)				GOES-H -01				144
NESDIS STAFF	DATA COLLECTION SYSTEM				GOES-H -05				145
GRM-A1	UNITED STATES	NASA-OSSA	01/00/89	GEOCENTRIC	GRM-A1		PROPOSED MISSION		145
ACUNA	VECTOR MAGNETOMETER				GRM-A1 -03				145
FARTHING	SCALAR MAGNETOMETER				GRM-A1 -02				145
SMITH	SST (S/C-TO-S/C TRACKING)				GRM-A1 -01				145
GRM-A2	UNITED STATES	NASA-OSSA	01/00/89	GEOCENTRIC	GRM-A2		PROPOSED MISSION		146
SMITH	SST (S/C-TO-S/C TRACKING)				GRM-A2 -01				146
GRO	UNITED STATES	NASA-OSSA	05/00/88	GEOCENTRIC	GRO		APPROVED MISSION		146
FICHTEL	HIGH-ENERGY GAMMA-RAY TELESCOPE				GRO -04				146
FISHMAN	TRANSIENT-EVENT MONITOR				GRO -05				147
KURFESS	SCINTILLATION SPECTROMETER				GRO -02				147
SCHONFELDER	IMAGING COMPTON TELESCOPE				GRO -03				147
GTL	SEE ISTP/GEOTAIL								
HAKUCHO	JAPAN	ISAS	02/21/79	GEOCENTRIC	79-014A	02/21/79	NORMAL	STND	36
MAKINO	DIFFUSE SOFT X-RAYS AND SOFT X-RAY SOURCES				79-014A-02	03/00/79	NORMAL	STND	36
MIYAMOTO	MONITOR OF X-RAY SOURCES				79-014A-01	03/00/79	NORMAL	STND	36
HELIOCENTRIC	SEE ISEE 3								
HELIOS 1	SEE HELIOS-A								
HELIOS-A	FED REP OF GERMANY	BMWF	12/10/74	HELIOCENTRIC	74-097A	12/10/74	NORMAL	STND	36
	UNITED STATES	NASA-OSSA							
FECHTIG	MICROMETEOROID DETECTOR AND ANALYZER				74-097A-12	12/10/74	NORMAL	STND	37
GURNETT	SOLAR WIND PLASMA WAVE				74-097A-04	03/10/75	PARTIAL	STND	37
GURNETT	FINE FREQUENCY, COARSE TIME RESOLUTION SPECTRUM ANALYSIS				74-097A-05	03/10/75	PARTIAL	STND	37
GURNETT	26.5-KHZ TO 3-MHZ RADIO WAVE				74-097A-06	03/10/75	PARTIAL	STND	37
KEPPLER	ENERGETIC ELECTRON AND PROTON DETECTOR				74-097A-10	12/10/74	NORMAL	STND	38
KUNOW	COSMIC-RAY PARTICLES				74-097A-07	12/10/74	NORMAL	STND	38
LEINERT	ZODIACAL LIGHT PHOTOMETER				74-097A-11	12/10/74	NORMAL	STND	38
NESS	FLUXGATE MAGNETOMETER FOR AVERAGE FIELDS				74-097A-02	12/10/74	NORMAL	STND	38
NEUBAUER	FLUXGATE MAGNETOMETER FOR FIELD FLUCTUATIONS				74-097A-01	12/10/74	NORMAL	STND	38
ROSENBAUER	PLASMA DETECTORS				74-097A-09	12/10/74	NORMAL	STND	38
TRAINOR	GALACTIC AND SOLAR COSMIC RAYS				74-097A-08	12/10/74	NORMAL	STND	39
HELOS	SEE EXOSAT								
HI.ECCEN LUN OCCULT.SAT.	SEE EXOSAT								
HILAT	UNITED STATES	DOD-USAF	06/27/83	GEOCENTRIC	83-063A	06/27/83	NORMAL	STND	39
	CANADA	NRC							
HARDY	ELECTRON SPECTROMETER				83-063A-04	06/27/83	NORMAL	STND	39
HUFFMAN	AURORAL IONOSPHERIC MAPPER				83-063A-05	06/27/83	PARTIAL	STND	39
POTEMRA	THREE-AXIS FLUXGATE MAGNETOMETER				83-063A-03	06/27/83	NORMAL	STND	39
RICH	PLASMA MONITOR				83-063A-02	06/27/83	NORMAL	STND	39
RINO	COHERENT BEACON				83-063A-01	06/27/83	NORMAL	STND	40

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HIMAWARI	SEE GMS								
HIMAWARI 2	SEE GMS 2								
HIMAWARI 3	SEE GMS 3								
HINOTORI	JAPAN	ISAS	02/21/81	GEOCENTRIC	81-017A	02/21/81	NORMAL	STND	40
HIRAO	PLASMA PROBES				81-017A-06	10/13/82	NORMAL	SUBS	40
KONDO	SOLAR FLARE GAMMA-RAY DETECTOR IN 0.2-9.0 MEV RANGE				81-017A-04	10/13/82	NORMAL	SUBS	40
MATSUOKA	TIME PROFILE AND SPECTRA OF X-RAY FLARES IN THE 2-20 KEV RANGE				81-017A-03	10/13/82	NORMAL	SUBS	40
TAKAKURA	SOLAR FLARE 5-40 KEV X-RAYS USING ROTATING MODULATION COLLIMATOR IMAGING				81-017A-01	10/13/82	NORMAL	SUBS	40
TAKEUCHI	ELECTRON FLUX ABOVE 100 KEV PARTICLE DETECTOR MONITOR				81-017A-05	10/13/82	NORMAL	SUBS	40
TANAKA	SOLAR FLARE X-RAY BRAGG SPECTROSCOPY IN 1.7-2.0 A RANGE				81-017A-02	10/13/82	NORMAL	SUBS	41
HIPPARCOS	INTERNATIONAL	ESA	04/00/88	GEOCENTRIC	HIPPA		APPROVED MISSION		147
HST	UNITED STATES INTERNATIONAL	NASA-OSSA ESA	06/00/86	GEOCENTRIC	LST		APPROVED MISSION		148
BLESS	HIGH-SPEED PHOTOMETER				LST -06				148
BRANDT	HIGH-RESOLUTION SPECTROGRAPH (HRS)				LST -02				148
HARMS	FAINT-OBJECT SPECTROGRAPH (FOS)				LST -03				148
JEFFERYS	ASTROMETRY SCIENCE				LST -09				149
MACCHETTO	FAINT-OBJECT CAMERA				LST -08				149
WESTPHAL	WIDE-FIELD CAMERA				LST -07				149
HUBBLE SPACE TELESCOPE	SEE HST								
ICE	SEE ISEE 3								
IK BULGARIA 1300	BULGARIA U.S.S.R.	BAS INTERCOS	08/07/81	GEOCENTRIC	81-075A				41
ARSHINKOV	TRIAXIAL FLUXGATE MAGNETOMETER				81-075A-11	08/07/83	INOPERABLE	ZERO	41
BANKOV	ION DRIFT METER AND RETARDING POTENTIAL ANALYZER				81-075A-01	08/07/83	INOPERABLE	ZERO	41
DACHEV	LOW-ENERGY ELECTRON-PROTON ELECTROSTATIC ANALYZER ARRAY IN 3 ORTHOGONAL DIRECTIONS				81-075A-05	08/07/83	INOPERABLE	ZERO	41
GOGOSHEV	VISIBLE AIRGLOW PHOTOMETERS				81-075A-08	08/07/83	INOPERABLE	ZERO	41
GOGOSHEV	WAVELENGTH SCANNING UV PHOTOMETER				81-075A-09	08/07/83	INOPERABLE	ZERO	41
IVANOVA	SPHERICAL ELECTROSTATIC ION TRAP				81-075A-02	08/07/83	INOPERABLE	ZERO	42
IVANOVA	CYLINDRICAL LANGMUIR PROBE				81-075A-03	08/07/83	INOPERABLE	ZERO	42
KAZAKOV	PHOTON SOLID-STATE TELESCOPE				81-075A-07	08/07/83	INOPERABLE	ZERO	42
MARKOV	DOUBLE SPHERICAL ELECTRON TEMPERATURE PROBES				81-075A-04	09/01/81	INOPERABLE	ZERO	42
NENOVSKI	ION ENERGY-MASS COMPOSITION ANALYZERS				81-075A-06	09/01/81	INOPERABLE	ZERO	42
STANEV	TRIAXIAL SPHERICAL VECTOR ELECTRIC FIELD PROBES				81-075A-10	08/07/83	INOPERABLE	ZERO	42
IME-D	SEE ISEE 2								
IME-H	SEE ISEE 3								
IMP 8	SEE IMP-J								
IMP-J	UNITED STATES	NASA-OSSA	10/26/73	GEOCENTRIC	73-078A	10/26/73	NORMAL	STND	43
AGGSON	ELECTROSTATIC FIELDS				73-078A-11	10/26/73	PARTIAL	STND	43
BAME	SOLAR PLASMA ELECTROSTATIC ANALYZER				73-078A-10	10/26/73	NORMAL	STND	43
BRIDGE	SOLAR PLASMA FARADAY CUP				73-078A-02	10/26/73	NORMAL	STND	43
FRANK	MEASUREMENT OF LOW-ENERGY PROTONS AND ELECTRONS				73-078A-04	10/26/73	NORMAL	STND	43
GLOECKLER	SOLID-STATE DETECTORS				73-078A-03	12/15/78	PARTIAL	STND	43
GURNETT	ELECTROSTATIC WAVES AND RADIO NOISE				73-078A-12	10/26/73	NORMAL	STND	44
KRIMIGIS	CHARGED PARTICLE MEASUREMENTS EXPERIMENT				73-078A-08	11/05/73	NORMAL	STND	44
MCGUIRE	SOLAR AND COSMIC-RAY PARTICLES				73-078A-09	10/26/73	NORMAL	STND	44
NESS	MAGNETIC FIELD EXPERIMENT				73-078A-01	10/26/73	NORMAL	STND	44
SIMPSON	SOLAR FLARE HIGH-Z/LOW-E AND LOW-Z ISOTOPE				73-078A-07	10/26/73	NORMAL	STND	44
STONE	ELECTRONS AND HYDROGEN AND HELIUM ISOTOPES				73-078A-06	10/26/73	NORMAL	STND	45
WILLIAMS	ENERGETIC ELECTRONS AND PROTONS				73-078A-05	10/26/73	NORMAL	STND	45
IMP-K	SEE ISEE 1								
IMP-K PRIME	SEE ISEE 2								
INDIAN NATIONAL SAT.	SEE INSAT 1B								
INDIAN NATIONAL SAT.	SEE INSAT-1C								
INDIAN REMOTE SENSNG SAT	SEE IRS-1A								

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INFRA-RED ASTRONOM SAT	SEE IRAS								
INFRARED SPACE OBSERV.	SEE ISO								
INSAT 1B	INDIA	ISRO	08/31/83	GEOCENTRIC	83-089B				45
IMD STAFF	VERY HIGH RESOLUTION RADIOMETER (VHRR)				83-089B-01	12/04/84	NORMAL	STND	45
IMD STAFF	DATA COLLECTION AND TRANSMISSION RELAY				83-089B-03	12/04/84	NORMAL	STND	45
P & T STAFF	TELECOMMUNICATIONS PACKAGE				83-089B-02	12/04/84	NORMAL	STND	45
INSAT-1C	INDIA	ISRO	06/00/86	GEOCENTRIC	INSAT1C		APPROVED MISSION		149
IMD STAFF	VERY HIGH RESOLUTION RADIOMETER (VHRR)				INSAT1C-01				149
IMD STAFF	DATA COLLECTION AND TRANSMISSION RELAY PACKAGE				INSAT1C-03				149
P & T STAFF	TELECOMMUNICATIONS PACKAGE				INSAT1C-02				150
INT ULTRAVIOLET EXPL	SEE IUE								
INTERCOSMOS BULGAR 1300	SEE IK BULGARIA 1300								
INTERNATIONL SOLAR POLAR	SEE ULYSSES								
INTERPLAN. PHYSICS LAB.	SEE ISTP/WIND								
INTNL COMETARY EXPLORER	SEE ISEE 3								
INTNL SUN EARTH EXPL-A	SEE ISEE 1								
INTNL SUN EARTH EXPL-C	SEE ISEE 3								
ION RELEASE MODULE	SEE AMPTE/IRM								
IPL	SEE ISTP/WIND								
IR ASTRON. SAT.	SEE IRAS								
IRAS	THE NETHERLANDS	NIVR	01/25/83	GEOCENTRIC	83-004A	11/21/83	INOPERABLE	ZERO	45
	UNITED STATES	NASA-OSSA							
	UNITED KINGDOM	SERC							
JOINT IRAS SWG	IR TELESCOPE				83-004A-01	11/21/83	INOPERABLE	ZERO	46
JOINT IRAS SWG	LOW RESOLUTION SPECTROMETER				83-004A-02	11/21/83	INOPERABLE	ZERO	46
IRM	SEE AMPTE/IRM								
IRS-1A	INDIA	ISRO	00/00/86	GEOCENTRIC	IRS-1A		APPROVED MISSION		150
ISRO STAFF	LINEAR IMAGING SELF-SCAN SENSORS (LISS I & II)				IRS-1A -01				150
ISEE 1	UNITED STATES	NASA-OSSA	10/22/77	GEOCENTRIC	77-102A	10/22/77	NORMAL	STND	46
ANDERSON	ELECTRONS AND PROTONS				77-102A-10	10/22/77	NORMAL	STND	46
BAME	FAST PLASMA AND SOLAR WIND IONS				77-102A-01	01/00/79	PARTIAL	STND	46
CLINE	GAMMA-RAY BURSTS				77-102A-14	10/22/77	NORMAL	STND	47
FRANK	HOT PLASMA				77-102A-03	10/22/77	NORMAL	STND	47
GURNETT	PLASMA WAVES				77-102A-07	10/22/77	NORMAL	STND	47
HARVEY	PLASMA DENSITY				77-102A-08	10/22/77	NORMAL	STND	47
HELLIWELL	VLF WAVE PROPAGATION				77-102A-13	10/22/77	NORMAL	STND	47
HEPPNER	DC ELECTRIC FIELD				77-102A-11	10/22/77	NORMAL	STND	48
HOVESTADT	LOW-ENERGY COSMIC RAYS				77-102A-05	08/07/78	PARTIAL	STND	48
MOZER	QUASI-STATIC ELECTRIC FIELDS				77-102A-06	05/03/84	INOPERABLE	ZERO	48
OGILVIE	FAST ELECTRONS				77-102A-02	10/22/77	NORMAL	STND	48
RUSSELL	FLUXGATE MAGNETOMETER				77-102A-04	10/22/77	NORMAL	STND	48
SHARP	ION COMPOSITION				77-102A-12	03/20/82	INOPERABLE	ZERO	49
ISEE 2	INTERNATIONAL	ESA	10/22/77	GEOCENTRIC	77-102B	10/22/77	NORMAL	STND	49
	UNITED STATES	NASA-OSSA							
ANDERSON	ELECTRONS AND PROTONS				77-102B-08	05/01/79	PARTIAL	STND	49
EGIDI	SOLAR WIND IONS				77-102B-02	12/00/80	INOPERABLE	ZERO	49
FRANK	HOT PLASMA				77-102B-03	01/10/78	PARTIAL	STND	49
GURNETT	PLASMA WAVES				77-102B-05	10/22/77	NORMAL	STND	50
HARVEY	RADIO PROPAGATION				77-102B-06	10/22/77	NORMAL	STND	50
RUSSELL	FLUXGATE MAGNETOMETER				77-102B-04	10/22/77	NORMAL	STND	50
WILLIAMS	ENERGETIC ELECTRONS AND PROTONS				77-102B-07	10/22/77	NORMAL	STND	50
ISEE 3	UNITED STATES	NASA-OSSA	08/12/78	SW/TAIL/COMET	78-079A	08/12/78	NORMAL	STND	50
ANDERSON	X- AND GAMMA-RAY BURSTS				78-079A-14	08/15/78	NORMAL	STND	51
BAME	SOLAR WIND PLASMA				78-079A-01	02/17/80	PARTIAL	STND	51
HOVESTADT	LOW-ENERGY COSMIC RAYS				78-079A-03	08/15/78	NORMAL	STND	51
HYNDS	ENERGETIC PROTONS				78-079A-08	08/15/78	NORMAL	STND	51
MEYER	COSMIC-RAY ELECTRONS AND NUCLEI				78-079A-06	08/15/78	NORMAL	STND	51
OGILVIE	SOLAR WIND ION COMPOSITION				78-079A-11	08/18/78	NORMAL	STND	51
SCARF	PLASMA WAVES				78-079A-07	08/12/78	NORMAL	STND	52
SMITH	MAGNETIC FIELDS				78-079A-02	08/12/78	NORMAL	STND	52
STEINBERG	RADIO MAPPING				78-079A-10	08/13/78	NORMAL	STND	52
STONE	HIGH-ENERGY COSMIC RAYS				78-079A-12	01/15/79	PARTIAL	STND	52
TEEGARDEN	GAMMA-RAY BURSTS				78-079A-15	01/15/79	PARTIAL	STND	52
VON ROSENVINGE	MEDIUM ENERGY COSMIC RAY				78-079A-04	08/15/78	NORMAL	STND	52

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WIEDENBECK	HIGH-ENERGY COSMIC RAY				78-079A-05	04/04/81	PARTIAL	STND	53
WILCOX (DECEASED)	GROUND BASED SOLAR STUDIES				78-079A-13		NA	NA	53
ISEE-A	SEE ISEE 1								
ISEE-B	SEE ISEE 2								
ISEE-C	SEE ISEE 3								
ISIS 1	CANADA UNITED STATES JAPAN	DRB-DRTE NASA-OSSA RRL	01/30/69	GEOCENTRIC	69-009A	07/16/84	PARTIAL	SUBS	53
BARRINGTON (FORMER)	VLF RECEIVER				69-009A-03	07/16/84	NORMAL	SUBS	53
BRACE (FORMER)	CYLINDRICAL ELECTROSTATIC PROBES				69-009A-07	03/09/84	NORMAL	ZERO	53
CALVERT (FORMER)	FIXED-FREQUENCY SOUNDER				69-009A-02	07/16/84	NORMAL	SUBS	54
HARTZ (RETIRED)	COSMIC RADIO NOISE				69-009A-10	07/16/84	NORMAL	SUBS	54
MCDIARMID (FORMER)	ENERGETIC PARTICLE DETECTORS				69-009A-04	03/09/84	NORMAL	ZERO	54
NELMS (FORMER)	SWEEP-FREQUENCY SOUNDER				69-009A-01	07/16/84	NORMAL	SUBS	54
SAGALYN (FORMER)	SPHERICAL ELECTROSTATIC ANALYZER				69-009A-08	03/09/84	NORMAL	ZERO	54
ISIS 2	CANADA UNITED STATES JAPAN	DOC-CRC NASA-OSSA RRL	04/01/71	GEOCENTRIC	71-024A	07/16/84	PARTIAL	SUBS	54
ANGER (FORMER)	3914- AND 5577-A PHOTOMETER				71-024A-11	03/09/84	NORMAL	ZERO	55
BARRINGTON (FORMER)	VLF RECEIVER				71-024A-03	07/16/84	NORMAL	SUBS	55
BRACE (FORMER)	CYLINDRICAL ELECTROSTATIC PROBES				71-024A-07	03/09/84	PARTIAL	ZERO	55
CALVERT (FORMER)	FIXED-FREQUENCY SOUNDER				71-024A-02	07/16/84	NORMAL	SUBS	55
HARTZ (RETIRED)	COSMIC RADIO NOISE				71-024A-10	07/16/84	NORMAL	SUBS	56
MAIER (FORMER)	RETARDING POTENTIAL ANALYZER				71-024A-08	03/09/84	NORMAL	ZERO	56
MCDIARMID (FORMER)	ENERGETIC PARTICLE DETECTORS				71-024A-04	03/09/84	PARTIAL	ZERO	56
SHEPHERD (FORMER)	6300-A PHOTOMETER				71-024A-12	03/09/84	NORMAL	ZERO	55
WHITTEKER (FORMER)	SWEEP-FREQUENCY SOUNDER				71-024A-01	07/16/84	NORMAL	SUBS	56
ISIS-A	SEE ISIS 1								
ISIS-B	SEE ISIS 2								
ISO	U.S.S.R.	ESA	00/00/92	GEOCENTRIC	ISO				150
UNKNOWN	INFRARED SPECTROMETRY				ISO -01				150
UNKNOWN	INFRARED PHOTOMETER/POLARIMETER				ISO -02				150
UNKNOWN	INFRARED CAMERA ARRAY				ISO -03				151
ISP	SEE ULYSSES								
ISPM	SEE ULYSSES								
ISPM-B	SEE ULYSSES								
ISPM/CENTAUR	SEE ULYSSES								
ISTP/EQUATOR	UNITED STATES	NASA-OSSA	02/00/91	GEOCENTRIC	EQUATOR		PROPOSED MISSION		151
BURCH	PLASMA ION COMPOSITION				EQUATOR-03				151
CHAPPELL	COLD PLASMA IONS (TIDE)				EQUATOR-09				151
FRITZ	CHARGE AND MASS MAGNETOSPHERIC ION COMPOSITION EXPERIMENT (CAMMICE)				EQUATOR-04				152
GURNETT	PLASMA WAVES				EQUATOR-08				152
HIGBIE	ENERGETIC ELECTRONS AND IONS				EQUATOR-02				152
MAYNARD	ELECTRIC FIELDS: BURST MODE				EQUATOR-05				152
MCILWAIN	ELECTRIC FIELD INVESTIGATION BY ELECTRON DRIFT STUDIES (EFIELDS)				EQUATOR-07				153
MCPHERRON	MAGNETIC FIELDS				EQUATOR-06				153
PARKS	HOT PLASMA				EQUATOR-01				153
ISTP/GEOTAIL	UNITED STATES	NASA-OSSA	03/00/91	GEOCENTRIC	GEOTAIL		PROPOSED MISSION		153
FRANK	HOT PLASMA AND ION COMPOSITION				GEOTAIL-04				154
MOZER	DC ELECTRIC FIELDS				GEOTAIL-05				154
SCARF	PLASMA WAVES				GEOTAIL-02				154
WILLIAMS	ENERGETIC PARTICLES AND ION COMPOSITION (EPIC)				GEOTAIL-03				154
ISTP/POLAR	UNITED STATES	NASA-OSSA	08/00/90	GEOCENTRIC	POLAR		PROPOSED MISSION		154
CHAPPELL	COLD PLASMA IONS (TIDE)				POLAR -04				155
FELDMAN	MULTI-SPECTRAL AURORAL IMAGING				POLAR -10				155
FRANK	OPTICAL AURORAL IMAGER				POLAR -12				155
FRITZ	CHARGE AND MASS MAGNETOSPHERIC ION COMPOSITION EXPERIMENT (CAMMICE)				POLAR -06				155
HIGBIE	ENERGETIC ELECTRONS AND IONS				POLAR -05				156
IMHOF	POLAR IONOSPHERIC X-RAY IMAGING EXPERIMENT (PIXIE)				POLAR -07				155
MOZER	DC ELECTRIC FIELDS				POLAR -09				156
RUSSELL	MAGNETIC FIELDS				POLAR -08				156
SCUDDER	HOT PLASMA				POLAR -03				157
SHAWHAN	PLASMA AND RADIO WAVES				POLAR -02				157
SHELLEY	PLASMA ION COMPOSITION				POLAR -01				157
TORR	ULTRAVIOLET IMAGER				POLAR -11				157

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ISTP/WIND	UNITED STATES	NASA-OSSA	03/00/89	HELIOCENTRIC	WIND		PROPOSED MISSION		158
BEHANNON	MAGNETIC FIELDS				WIND -04				158
GLOECKLER	SOLAR WIND AND SUPRATHERMAL ION COMPOSITION STUDIES				WIND -08				158
KAISER	PLASMA AND RADIO WAVES				WIND -05				158
LIN	HOT PLASMA AND CHARGED PARTICLES				WIND -01				159
OGILVIE	SOLAR WIND PLASMA				WIND -06				159
TEEGARDEN	GAMMA RAY BURSTS AND EUV SPECTROSCOPY				WIND -02				159
VON ROSENVINGE	COSMIC RAYS (EPACT): ENERGETIC PARTICLE ACCELERATION-COMPOSITION-TRANSPORT				WIND -07				159
IUE	INTERNATIONAL	ESA	01/26/78	GEOCENTRIC	78-012A	01/26/78	NORMAL	STND	57
	UNITED STATES	NASA-OSSA							
	UNITED KINGDOM	SRC							
GUEST INVESTIGATORS	LOW-/HIGH-RESOLUTION, ULTRAVIOLET SPECTROGRAPH PACKAGE				78-012A-01	01/26/78	NORMAL	STND	57
NONE ASSIGNED	PARTICLE FLUX MONITOR (SPACECRAFT)				78-012A-02	01/26/78	NORMAL	STND	57
JOP	SEE GALILEO PROBE								
JOP	SEE GALILEO ORBITER								
JUPITER ORBITER PROBE	SEE GALILEO PROBE								
JUPITER ORBITER PROBE	SEE GALILEO ORBITER								
LAND SATELLITE-E	SEE LANDSAT 5								
LANDSAT 2	UNITED STATES	NASA-OSSA	01/22/75	GEOCENTRIC	75-004A	07/27/83	INOPERABLE	ZERO	57
FREDEN	MULTISPECTRAL SCANNER (MSS)				75-004A-02	07/27/83	INOPERABLE	ZERO	58
LANDSAT 3	UNITED STATES	NASA-OSSA	03/05/78	GEOCENTRIC	78-026A	09/07/83	INOPERABLE	ZERO	58
FREDEN	RETURN BEAM VIDICON CAMERA (RBV)				78-026A-01	09/07/83	INOPERABLE	ZERO	58
FREDEN	MULTISPECTRAL SCANNER (MSS)				78-026A-02	09/07/83	INOPERABLE	ZERO	58
KENNY	DATA COLLECTION SYSTEM (DCS)				78-026A-03	09/07/83	INOPERABLE	ZERO	59
LANDSAT 4	UNITED STATES	NASA-OSSA	07/16/82	GEOCENTRIC	82-072A	02/15/83	PARTIAL	SUBS	59
	UNITED STATES	NOAA-NESS							
BARKER	THEMATIC MAPPER (TM)				82-072A-01	02/15/83	PARTIAL	ZERO	59
FEINBERG	GLOBAL POSITIONING SYSTEM (GPS)				82-072A-03	03/01/83	PARTIAL	ZERO	59
SALOMONSON	MULTISPECTRAL SCANNER (MSS)				82-072A-02	08/15/84	PARTIAL	SUBS	59
LANDSAT 5	UNITED STATES	NASA-OSSA	03/01/84	GEOCENTRIC	84-021A	03/01/84	NORMAL	STND	60
	UNITED STATES	NOAA-NESS							
BARKER	THEMATIC MAPPER (TM)				84-021A-01	03/15/84	NORMAL	STND	60
FEINBERG	GLOBAL POSITIONING SYSTEM (GPS)				84-021A-03	03/01/84	NORMAL	STND	60
SALOMONSON	MULTISPECTRAL SCANNER (MSS)				84-021A-02	03/05/84	NORMAL	STND	60
LANDSAT-C	SEE LANDSAT 3								
LANDSAT-D	SEE LANDSAT 4								
LANDSAT-D1	SEE LANDSAT 5								
LARGE SPACE TELESCOPE	SEE HST								
LDEF	SEE SPACE SHUTTLE LDEF 1								
LDEF 1/STS41C	SEE SPACE SHUTTLE LDEF 1								
LDEF-A	SEE SPACE SHUTTLE LDEF 1								
LFO-A	SEE LANDSAT 4								
LIFE SCIENCES SPACELAB 1	SEE SLS-A								
LONG DURATION EXPOS.FAC.	SEE SPACE SHUTTLE LDEF 1								
MARINE OBSERV. SAT. 1	SEE MOS-A								
MARINER 77A	SEE VOYAGER 1								
MARINER 77B	SEE VOYAGER 2								
MARINER JUPITER/SATURN A	SEE VOYAGER 1								
MARINER JUPITER/SATURN B	SEE VOYAGER 2								
MATERIALS SCIENCE LAB-1	SEE MSL 1								
MATERIALS SCIENCE LAB-2	SEE MSL 2								
METEOROLOGICAL SAT-A	SEE METEOSAT 1								
METEOROLOGICAL SAT-B	SEE METEOSAT 2								

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METEOSAT 1	INTERNATIONAL	ESA	11/23/77	GEOCENTRIC	77-108A	12/11/84	NORMAL	STND	60
PERA	DATA COLLECTION PLATFORM (DCP)				77-108A-02	12/11/84	NORMAL	STND	61
METEOSAT 2	INTERNATIONAL	ESA	06/19/81	GEOCENTRIC	81-057A	12/11/84	NORMAL	STND	61
SERENE	IMAGING RADIOMETER				81-057A-01	12/11/84	NORMAL	STND	61
METEOSAT-B	SEE METEOSAT 2								
METEOSAT-P2	SEE MTSATP2								
MJS 77A	SEE VOYAGER 1								
MJS 77B	SEE VOYAGER 2								
MOS 1	SEE MOS-A								
MOS-A	JAPAN	NASDA	06/00/86	GEOCENTRIC	MOS-A		APPROVED MISSION		160
EARTH OBS CTR	MULTISPECTRAL ELECTRONIC SELF-SCANNING RADIOMETER (MESSR)				MOS-A -01				160
EARTH OBS CTR	VISIBLE AND THERMAL INFRARED RADIOMETER (VTIR)				MOS-A -02				160
EARTH OBS CTR	MICROWAVE SCANNING RADIOMETER (MSR)				MOS-A -03				160
EARTH OBS CTR	DATA COLLECTION SYSTEM TRANSPONDER (DCS TRANSPONDER)				MOS-A -04				160
MOTHER	SEE ISEE 1								
MS-T5	SEE SAKIGAKE								
MSL 1	UNITED STATES	NASA-OSSA	10/00/85	GEOCENTRIC	MSL-1		APPROVED MISSION		160
CROUCH	DIRECTIONAL SOLIDIFICATION OF COMPOUND SEMICONDUCTOR MATERIALS				MSL-1 -01				161
DAY	CONTAINERLESS PROCESSING OF GLASS-FORMING MELTS				MSL-1 -02				161
GELLES	LIQUID PHASE MISCIBILITY GAP MATERIALS				MSL-1 -03				161
POND	DIFFUSION OF MISCIBILITY GAP ALLOYS				MSL-1 -04				161
WIEDEMEIER	VAPOR GROWTH OF ALLOY-TYPE SEMICONDUCTOR CRYSTAL				MSL-1 -05				161
MSL 2	UNITED STATES	NASA-OSSA	08/00/85	GEOCENTRIC	MSL-2		APPROVED MISSION		161
FLEMING	UNDERCOOLED SOLIDIFICATION IN QUIESCENT LEVITATED DROPS				MSL-2 -01				162
LARSON, JR.	ORBITAL PROCESSING OF ALIGNED MAGNETIC COMPOSITE				MSL-2 -02				162
SUBRUMANIAN	PHYSICAL PHENOMENA IN CONTAINERLESS GLASS PROCESSING-MODEL FLUIDS				MSL-2 -03				162
WANG	DYNAMICS OF COMPOUND DROPS				MSL-2 -04				162
MSL-A	SEE MSL 1								
MSL-B	SEE MSL 2								
MTSATP2	INTERNATIONAL	ESA	03/00/86	GEOCENTRIC	MTSATP2		APPROVED MISSION		162
PERA	DATA COLLECTION PLATFORM (DCP)				MTSATP2-02				162
SERENE	MULTISPECTRAL (VISIBLE AND INFRARED) IMAGING RADIOMETER				MTSATP2-01				163
NIMBUS 6	UNITED STATES	NASA-OSSA	06/12/75	GEOCENTRIC	75-052A	09/00/83	PARTIAL	ZERO	61
HOUGHTON	PRESSURE MODULATED RADIOMETER (PMR)				75-052A-09	03/02/81	PARTIAL	ZERO	62
JULIAN	TROPICAL WIND ENERGY CONVERSION AND REFERENCE LEVEL (TWERLE)				75-052A-01	03/02/81	PARTIAL	SUBS	62
KYLE	EARTH RADIATION BUDGET (ERB)				75-052A-05	03/02/81	PARTIAL	ZERO	62
WILHEIT, JR.	ELECTRICALLY SCANNING MICROWAVE RADIOMETER (ESMR)				75-052A-03	03/02/81	PARTIAL	ZERO	63
NIMBUS 7	UNITED STATES	NASA-OSSA	10/24/78	GEOCENTRIC	78-098A	10/24/78	NORMAL	STND	63
GLOERSEN	SCANNING MULTISPECTRAL MICROWAVE RADIOMETER (SMMR)				78-098A-08	10/24/78	NORMAL	STND	63
HEATH	SOLAR BACKSCATTER ULTRAVIOLET/TOTAL OZONE MAPPING SPECTROMETER (SBUV/TOMS)				78-098A-09	10/24/78	NORMAL	STND	63
HOVIS	COASTAL ZONE COLOR SCANNER (CZCS)				78-098A-03	10/29/78	PARTIAL	SUBS	64
KYLE	EARTH RADIATION BUDGET (ERB)				78-098A-07	06/22/80	PARTIAL	STND	64
MCCORMICK	STRATOSPHERIC AEROSOL MEASUREMENT-II (SAM-II)				78-098A-06	10/24/78	NORMAL	STND	64
STOWE	TEMPERATURE/HUMIDITY INFRARED RADIOMETER (THIR)				78-098A-10	10/24/78	NORMAL	STND	64
TAYLOR	STRATOSPHERIC AND MESOSPHERIC SOUNDER (SAMS)				78-098A-02	08/00/83	PARTIAL	ZERO	65
NIMBUS-F	SEE NIMBUS 6								
NIMBUS-G	SEE NIMBUS 7								
NOAA 6	UNITED STATES	NOAA-NESS	06/27/79	GEOCENTRIC	79-057A	06/27/79	NORMAL	STND	65
LEINBACH	SPACE ENVIRONMENT MONITOR (SEM)				79-057A-04	06/27/79	NORMAL	STND	65
NESDIS STAFF	ADVANCED VERY HIGH RESOLUTION RADIOMETER				79-057A-01	02/23/82	PARTIAL	SUBS	65

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	(AVHRR)								
NESDIS STAFF	TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)				79-057A-02	09/19/83	PARTIAL	STND	66
NESDIS STAFF	DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCLS)				79-057A-03	06/27/79	NORMAL	STND	66
NOAA 7	UNITED STATES	NOAA-NESS	06/23/81	GEOCENTRIC	81-059A	06/23/81	NORMAL	STND	66
LEINBACH	SPACE ENVIRONMENT MONITOR (SEM)				81-059A-04	04/08/82	PARTIAL	SUBS	66
NESDIS STAFF	ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)				81-059A-01	07/13/81	NORMAL	STND	66
NESDIS STAFF	TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)				81-059A-02	05/00/83	PARTIAL	STND	67
NESDIS STAFF	DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCLS)				81-059A-03	07/13/81	NORMAL	STND	67
NOAA 8	UNITED STATES	NOAA-NESS	03/28/83	GEOCENTRIC	83-022A	06/12/84	INOPERABLE	ZERO	67
	UNITED STATES	NASA-OSSA							
LEINBACH	SPACE ENVIRONMENT MONITOR (SEM)				83-022A-04	06/12/84	NORMAL	ZERO	67
NESDIS STAFF	ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)				83-022A-01	06/12/84	NORMAL	ZERO	67
NESDIS STAFF	TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)				83-022A-02	06/12/84	NORMAL	ZERO	68
NESDIS STAFF	DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCLS)				83-022A-03	10/01/83	PARTIAL	ZERO	68
NESDIS STAFF	SEARCH AND RESCUE SATELLITE AIDED TRACKING (SARSAT)				83-022A-05	06/12/84	NORMAL	ZERO	68
NOAA 9	UNITED STATES	NOAA-NESS	12/12/84	GEOCENTRIC	84-123A	12/12/84	NORMAL	STND	68
	UNITED STATES	NASA-OSSA							
BROOME	EARTH RADIATION BUDGET EXPERIMENT (ERBE)				84-123A-05	02/15/85	NORMAL	STND	68
CUNNINGHAM	SOLAR BACKSCATTER ULTRAVIOLET RADIOMETER, SBUV/2				84-123A-07	02/22/85	NORMAL	STND	69
NESDIS STAFF	ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)				84-123A-01	12/12/84	NORMAL	STND	69
NESDIS STAFF	TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)				84-123A-02	12/12/84	NORMAL	STND	69
NESDIS STAFF	DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCLS)				84-123A-03	12/12/84	NORMAL	STND	69
NESDIS STAFF	SEARCH AND RESCUE SATELLITE AIDED TRACKING (SARSAT)				84-123A-06	12/12/84	NORMAL	STND	69
NOAA-A	SEE NOAA 6								
NOAA-C	SEE NOAA 7								
NOAA-D	SEE NOAA-X								
NOAA-E	SEE NOAA 8								
NOAA-F	SEE NOAA 9								
NOAA-G	SEE NOAA-X								
NOAA-H	SEE NOAA-X								
NOAA-I	SEE NOAA-X								
NOAA-J	SEE NOAA-X								
NOAA-X	UNITED STATES	NOAA-NESS		GEOCENTRIC	NOAA-X				163
	UNITED STATES	NASA-OSSA							
BROOME	EARTH RADIATION BUDGET EXPERIMENT (ERBE)				NOAA-X -05				163
CUNNINGHAM	SOLAR BACKSCATTER ULTRAVIOLET RADIOMETER (SBUV/2)				NOAA-X -07				163
LEINBACH	SPACE ENVIRONMENTAL MONITOR (SEM)				NOAA-X -04				163
NESDIS STAFF	ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)				NOAA-X -01				164
NESDIS STAFF	TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)				NOAA-X -02				164
NESDIS STAFF	DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCLS)				NOAA-X -03				164
NESDIS STAFF	SEARCH AND RESCUE SATELLITE AIDED TRACKING (SARSAT)				NOAA-X -06				164
OCEAN TOPOGRAPHY EXPER.	SEE TOPEX								
OHZORA	JAPAN	ISAS	02/14/84	GEOCENTRIC	84-015A	02/14/84	NORMAL	STND	70
DOKE	MONITOR OF HIGH ENERGY PARTICLES				84-015A-08	02/23/84	NORMAL	STND	70
MAKINO	LIMB SCANNING IR RADIOMETER				84-015A-01	02/23/84	NORMAL	STND	70
MATSUZAKI	INFRARED SOLAR SPECTROMETER				84-015A-03	02/23/84	NORMAL	STND	70
MUKAI	PRECIPITATING PARTICLE ENERGY ANALYZER				84-015A-04	03/21/84	NORMAL	STND	70
OGAWA	ULTRAVIOLET SPECTROMETER				84-015A-02	03/21/84	NORMAL	STND	70
OYA	TOPSIDE PLASMA SOUNDER				84-015A-06	06/04/84	NORMAL	STND	70
TAKAGI	SOLAR IMAGE-RADIOMETER				84-015A-05	02/23/84	NORMAL	STND	70
TAKAHASHI	PLASMA PROBES				84-015A-07	02/23/84	NORMAL	STND	70

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OREOL 3	SEE AUREOL 3								
OSS-2	SEE SHEAL-A								
OSTA-3/STS 41-G	SEE STS 41-G								
OUTER PLANETS A	SEE VOYAGER 1								
OUTER PLANETS B	SEE VOYAGER 2								
P78-1	SEE STP P78-1								
P78-2	SEE STP P78-2								
P80-1	SEE AFP-888								
P83-1	SEE HILAT								
PIONEER 10	UNITED STATES	NASA-OSSA	03/03/72	JUPITER FLYBY	72-012A	03/03/72	NORMAL	STND	71
ANDERSON	CELESTIAL MECHANICS				72-012A-09	03/03/72	NORMAL	STND	71
BARNES	QUADRISPHERICAL PLASMA ANALYZER				72-012A-13	03/03/72	NORMAL	STND	71
FILLIUS	JOVIAN TRAPPED RADIATION				72-012A-05	12/19/73	NORMAL	STND	71
GEHRELS	IMAGING PHOTOPOLARIMETER (IPP)				72-012A-07	06/01/80	NORMAL	ZERO	72
JUDGE	ULTRAVIOLET PHOTOMETRY				72-012A-06	03/03/72	NORMAL	STND	72
KLIORE	S-BAND OCCULTATION				72-012A-10	12/05/73	NORMAL	ZERO	72
MCDONALD	COSMIC-RAY SPECTRA				72-012A-12	03/03/72	NORMAL	STND	72
SIMPSON	CHARGED PARTICLE COMPOSITION				72-012A-02	03/03/72	NORMAL	STND	72
VAN ALLEN	JOVIAN CHARGED PARTICLES				72-012A-11	03/03/72	NORMAL	STND	73
PIONEER 11	UNITED STATES	NASA-OSSA	04/06/73	SATURN FLYBY	73-019A	04/06/73	NORMAL	STND	73
ANDERSON	CELESTIAL MECHANICS				73-019A-09	04/06/73	NORMAL	STND	73
BARNES	QUADRISPHERICAL PLASMA ANALYZER				73-019A-13	12/04/77	NORMAL	STND	73
FILLIUS	JOVIAN TRAPPED RADIATION				73-019A-05	04/06/73	NORMAL	STND	74
GEHRELS	IMAGING PHOTOPOLARIMETER (IPP)				73-019A-07	03/01/84	INOPERABLE	ZERO	74
INGERSOLL	INFRARED RADIOMETER				73-019A-08	10/03/79	NORMAL	ZERO	74
JUDGE	ULTRAVIOLET PHOTOMETRY				73-019A-06	04/06/73	NORMAL	STND	74
KINARD	METEOROID DETECTORS				73-019A-04	03/01/84	INOPERABLE	ZERO	74
KLIORE	S-BAND OCCULTATION				73-019A-10	09/02/79	NORMAL	ZERO	75
MCDONALD	COSMIC-RAY SPECTRA				73-019A-12	04/06/73	NORMAL	STND	75
SIMPSON	CHARGED PARTICLE COMPOSITION				73-019A-02	04/06/73	NORMAL	STND	75
SMITH	MAGNETIC FIELDS				73-019A-01	04/06/73	NORMAL	STND	75
VAN ALLEN	JOVIAN CHARGED PARTICLES				73-019A-11	04/06/73	NORMAL	STND	75
PIONEER VENUS 1	UNITED STATES	NASA-OSSA	05/20/78	VENUS ORBITER	78-051A	05/20/78	NORMAL	STND	75
BARNES	SOLAR WIND PLASMA ANALYZER (OPA)				78-051A-18	05/20/78	NORMAL	STND	76
BRACE	ELECTRON TEMPERATURE PROBE (OETP)				78-051A-01	12/05/78	NORMAL	STND	76
CROFT	GAS-PLASMA ENVIRONMENT-DUAL FREQUENCY EXPERIMENT (OGPE)				78-051A-03	00/00/82	INOPERABLE	ZERO	76
DONAHUE	INTERDISCIPLINARY SCIENTIST				78-051A-04		NA	NA	76
EVANS	GAMMA BURST DETECTOR (OGBD)				78-051A-05	05/20/78	NORMAL	STND	76
KEATING	ATMOSPHERIC DRAG (OAD)				78-051A-19	12/00/78	NORMAL	STND	76
KLIORE	RADIO OCCULTATION (ORO)				78-051A-20	01/01/81	INOPERABLE	ZERO	77
KNUDSEN	RETARDING POTENTIAL ANALYZER (ORPA)				78-051A-07	05/20/78	NORMAL	STND	77
MASURSKY	INTERDISCIPLINARY SCIENTIST				78-051A-08		NA	NA	77
MCGILL	INTERDISCIPLINARY SCIENTIST				78-051A-09		NA	NA	77
NAGY	INTERDISCIPLINARY SCIENTIST				78-051A-10		NA	NA	77
NIEMANN	NEUTRAL MASS SPECTROMETER (ONMS)				78-051A-11	12/05/78	NORMAL	STND	77
PHILLIPS	INTERNAL DENSITY DISTRIBUTION (OIDD)				78-051A-23				77
RUSSELL	MAGNETOMETER (OMAG)				78-051A-12	05/20/78	NORMAL	STND	78
SCARF	ELECTRIC FIELD DETECTOR (OEFD)				78-051A-13	05/20/78	NORMAL	STND	78
SCHUBERT	INTERDISCIPLINARY SCIENTIST				78-051A-14		NA	NA	78
SHAPIRO	CELESTIAL MECHANICS (OCM)				78-051A-21	01/01/81	INOPERABLE	ZERO	78
STEWART	PROGRAMMABLE ULTRAVIOLET SPECTROMETER (OUVS)				78-051A-15	12/05/78	NORMAL	STND	78
TAYLOR, JR.	ION MASS SPECTROMETER 1-60AMU (OIMS)				78-051A-17	12/05/78	NORMAL	STND	78
TRAVIS	CLOUD PHOTOPOLARIMETER				78-051A-06	05/20/78	NORMAL	STND	78
WOO	ATMOSPHERIC AND SOLAR CORONA TURBULENCE (OTUR)				78-051A-22	12/00/78	NORMAL	STND	79
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PIONEER VENUS ORBITER	SEE PIONEER VENUS 1								
PIONEER-F	SEE PIONEER 10								
PIONEER-G	SEE PIONEER 11								
PLANET-A	JAPAN	ISAS	08/14/85	COMET RENDEZVOU	PLANETA		APPROVED MISSION		164
KANEDA	UV IMAGING TELESCOPIC CAMERA				PLANETA-01				165
MUKAI	ION ELECTRON ESAS				PLANETA-02				165
POLAR BEAR	UNITED STATES	DOD-USAF	10/00/86	GEOCENTRIC	PLRBEAR		PROPOSED MISSION		165
FREMOUW	MULTI-FREQUENCY COHERENT RADIO BEACON				PLRBEAR-01				165
HUFFMAN	AURORAL/IONOSPHERIC REMOTE SENSOR				PLRBEAR-02				165
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PROGNOZ 8	U.S.S.R.	SAS	12/25/80	GEOCENTRIC	80-103A	06/00/83	INOPERABLE	ZERO	79
LICKIN	SOLAR X-RAY SPECTROMETER				80-103A-01	06/00/83	INOPERABLE	ZERO	79
PROGNOZ 9	U.S.S.R.	SAS	07/01/83	GEOCENTRIC	83-067A				79
STRUKOV	COSMIC RADIO TELESCOPE				83-067A-01	07/01/83	NORMAL	STND	79
ROENTGENSATELLITE	SEE ROSAT								
ROSAT	FED REP OF GERMANY UNITED STATES	DFVLR NASA-OSSA	09/00/87	GEOCENTRIC	ROSAT		APPROVED MISSION		165
GERDES	HIGH RESOLUTION IMAGER (HRI)				ROSAT -01				165
TRUEMPER	POSITION SENSITIVE PROPORTIONAL COUNTER (PSPC)				ROSAT -02				166
WELLS	WIDE FIELD CAMERA				ROSAT -03				165
SAKIGAKE	JAPAN	ISAS	01/07/85	HELIOCENTRIC	85-001A	01/07/85	NORMAL	STND	79
OYA	PLASMA WAVE SPECTRAL RECEIVERS				85-001A-01				80
OYAMA	ION RETARDING POTENTIAL ANALYZER				85-001A-02				80
SAITO	TRIAXIAL RING-CORE MAGNETOMETERS				85-001A-03				80
SAN MARCO-D/L	ITALY UNITED STATES	CRA NASA-OSSA	04/00/85	GEOCENTRIC	SM-DL		APPROVED MISSION		166
BROGLIO	DRAG BALANCE AND AIR DENSITY				SM-DL -01				166
HANSON	ION VELOCITY INSTRUMENT (IVI) PLANAR RETARDING POTENTIAL ANALYZER				SM-DL -03				166
MAYNARD	3-AXIS ELECTRIC FIELD INSTRUMENT (EFI)				SM-DL -05				166
SCHMIDTKE	AIRGLOW-SOLAR SPECTROMETER				SM-DL -02				167
SPENCER	WIND AND TEMPERATURE SPECTROMETER (WATS)				SM-DL -04				167
SAS-D	SEE IUE								
SAT. FOR EARTH OBS. 2	SEE BHASKARA 2								
SAT. FOR X-RAY ASTRONOMY	SEE SAX								
SAX	ITALY	SAX	00/00/88	GEOCENTRIC	SAX		APPROVED MISSION		167
UNKNOWN	NARROW FIELD X-RAY IMAGING CONCENTRATORS				SAX -01				167
UNKNOWN	NARROW FIELD GAS SCINTILLATION PROPORTIONAL COUNTER (PHOSWICH)				SAX -02				167
UNKNOWN	NARROW FIELD SODIUM IODIDE SCINTILLATION DETECTOR				SAX -03				167
UNKNOWN	WIDE FIELD MULTIWIRE PROPORTIONAL COUNTER CAMERA				SAX -04				168
SCATHA	SEE STP P78-2								
SEO	SEE BHASKARA								
SEO 2	SEE BHASKARA 2								
SESP P78-2A	SEE STP P78-2								
SHEAL-A	UNITED STATES	NASA-OSSA	03/00/88	GEOCENTRIC	OSS-2		APPROVED MISSION		168
GORENSTEIN	LARGE AREA MODULAR ARRAY OF REFLECTORS (LAMAR)				OSS-2 -01				168
KRAUSHAAR	DIFFUSE X-RAY SPECTROMETER (DXS)				OSS-2 -02				168
MEYER	COSMIC RAY NUCLEI EXPERIMENT (CRNE)				OSS-2 -03				168
SERLEMITSOS	BROAD BAND X-RAY TELESCOPE (BBXRT)				OSS-2 -04				168
SIGMA	FRANCE U.S.S.R.	CNES UNKNOWN	00/00/87	GEOCENTRIC	SIGMA				169
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SLS-A	UNITED STATES	NASA-OSSA	01/00/86	GEOCENTRIC	SPALAB4		APPROVED MISSION		169
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DUNN	REGULATION OF ERYTHROPOIESIS DURING SPACE FLIGHT				SPALAB4-02				169
DUNN	INFLUENCE OF SPACEFLIGHT ON ERYTHROKINETICS IN MAN				SPALAB4-03				170
ECKBERG	INFLUENCE OF WEIGHTLESSNESS UPON HUMAN AUTONOMIC CARDIOVASCULAR CONTROL				SPALAB4-04				170
FARHI	INFLIGHT STUDY OF CARDIOVASCULAR DECONDITIONING				SPALAB4-05				170
FULLER	THERMOREGULATION IN PRIMATES IN THE SPACE ENVIRONMENT				SPALAB4-06				170
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HUTCHINS	CORRELATION OF MICRO AND MACRO CIRCULATORY CHANGES DURING 0-G				SPALAB4-08				170
JOHNSON	REGULATION OF BLOOD VOLUME DURING SPACE FLIGHT				SPALAB4-09				170
LEACH	FLUID-ELECTROLYTE REGULATION DURING				SPALAB4-10				171

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	SPACEFLIGHT								
MOORE-EDE	STUDY OF FLUID/ELECTROLYTE HOMEOSTATIS IN 0-G USING PRIMATES				SPALAB4-11				171
POPOVIC	CARDIOVASCULAR ADAPTION OF WHITE RATS TO 0-G				SPALAB4-12				171
ROSS	EFFECTS OF 0-G ON MAMMALIAN GRAVITY RECEPTORS				SPALAB4-13				171
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YOUNG	VESTIBULAR EXPERIMENTS IN SPACELAB				SPALAB4-15				171
SME	UNITED STATES	NASA-OSSA	10/06/81	GEOCENTRIC	81-100A	10/06/81	NORMAL	STND	80
BARTH	UV OZONE				81-100A-01	10/06/81	NORMAL	STND	80
BARTH	INFRARED RADIOMETER (4 CHANNELS)				81-100A-02	10/06/81	NORMAL	STND	80
BARTH	1.27 MICROMETER AIRGLOW				81-100A-03	10/06/81	NORMAL	STND	80
BARTH	VISIBLE NITROGEN DIOXIDE				81-100A-04	10/06/81	NORMAL	STND	81
BARTH	SOLAR UV MONITOR				81-100A-05	10/06/81	NORMAL	STND	81
BARTH	SOLAR PROTON ALARM				81-100A-06	10/06/81	NORMAL	STND	81
SMM	UNITED STATES	NASA-OSSA	02/14/80	GEOCENTRIC	80-014A	08/01/80	PARTIAL	SUBS	81
ACTON	SOFT X-RAY POLYCHROMATOR (XRP)				80-014A-04	04/15/84	NORMAL	STND	81
CHUPP	GAMMA-RAY SPECTROMETER (GRE)				80-014A-07	04/15/84	NORMAL	STND	82
DE JAGER	HARD X-RAY IMAGING SPECTROMETER (HXIS)				80-014A-05	04/18/84	INOPERABLE	ZERO	82
FROST	HARD X-RAY BURST SPECTROMETER (HXRBS)				80-014A-06	04/15/84	NORMAL	STND	82
MACQUEEN	CORONAGRAPH/POLARIMETER				80-014A-01	04/17/84	NORMAL	STND	82
TANDBERG-HANSSEN	ULTRAVIOLET SPECTROMETER AND POLARIMETER				80-014A-02	09/18/84	NORMAL	STND	83
WILLSON	ACTIVE CAVITY RADIOMETER IRRADIANCE MONITOR				80-014A-08	04/26/84	NORMAL	STND	83
SMS-C	SEE GOES 1								
SOLAR MAXIMUM MISSION	SEE SMM								
SOLAR MESOSPHERE EXPL	SEE SME								
SOLAR OPTICAL TELESCOPE	UNITED STATES	NASA-OSSA	03/00/91	GEOCENTRIC	SOT-1		APPROVED MISSION		171
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ZIRIN	PHOTOMETRIC FILTERGRAPH				SOT-1 -02				172
SOLAR POLAR	SEE ULYSSES								
SOLWIND	SEE STP P78-1								
SOT-1	SEE SOLAR OPTICAL TELESC.								
SPACE ASTROMETRY	SEE HIPPARCOS								
SPACE SHUTTLE LDEF 1	UNITED STATES	NASA-OSSA	04/06/84	GEOCENTRIC	84-034B	04/06/84	NORMAL	NA	83
ADAMS, JR.	HEAVY IONS IN SPACE				84-034B-13	04/06/84	NORMAL	NA	83
ALLEN	BALLOON MATERIALS DEGRADATION				84-034B-38	04/06/84	NORMAL	NA	83
ALSTON	SEEDS IN SPACE EXPERIMENT				84-034B-62	04/06/84	NORMAL	NA	84
ANGELO, JR.	SPACE ENVIRONMENT EFFECTS				84-034B-64	04/06/84	NORMAL	NA	84
ASSIE	MICROWELDING OF VARIOUS METALLIC MATERIALS UNDER ULTRAVACUUM				84-034B-56	04/06/84	NORMAL	NA	84
BEAUJEAN	MEASUREMENT OF HEAVY COSMIC-RAY NUCLEI ON LDEF				84-034B-59	04/06/84	NORMAL	NA	84
BENTON	LINEAR ENERGY TRANSFER SPECTRUM MEASUREMENT EXPERIMENT				84-034B-60	04/06/84	NORMAL	NA	84
BERSET	THIN METAL FILM AND EVAPORATED CATHODES PERFORMANCE IN SPACE				84-034B-40	04/06/84	NORMAL	NA	84
BLUE	EFFECTS OF LONG-DURATION EXPOSURE ON ACTIVE OPTICAL SYSTEMS COMPONENTS				84-034B-26	04/06/84	NORMAL	NA	85
BOURRIEAU	OPTICAL FIBERS AND COMPONENTS				84-034B-43	04/06/84	NORMAL	NA	85
BRANDHORST, JR.	ADVANCED PHOTOVOLTAIC EXPERIMENT				84-034B-02	04/06/84	NORMAL	NA	85
BUCKER	FREE FLYER BIOSTACK				84-034B-50	04/06/84	NORMAL	NA	85
CALHOUN	CASCADE VARIABLE CONDUCTANCE HEAT PIPE				84-034B-39	04/06/84	NORMAL	NA	85
CALLEN	SPACE TESTING OF HOLOGRAPHIC DATA STORAGE CRYSTALS				84-034B-08	04/06/84	NORMAL	NA	85
DEIASI	EFFECTS OF SPACE ENVIRONMENT ON SPACE-BASED RADAR PHASED-ARRAY ANTENNA				84-034B-20	04/06/84	NORMAL	NA	85
ELBERG	EFFECT OF SPACE EXPOSURE ON THERMAL AND MECHANICAL PROPERTIES OF EPOXY COMPOSITES				84-034B-54	04/06/84	NORMAL	NA	85
FELBECK	SPACE EXPOSURE INFLUENCE ON MECHANICAL PROPERTIES OF HI-TOUGHNESS GRAPHITE EPOXY				84-034B-06	04/06/84	NORMAL	NA	86
GREENE	LDEF THERMAL MEASUREMENT SYSTEM				84-034B-57	04/06/84	NORMAL	NA	86
GREGORY	THE INTERACTION OF ATOMIC OXYGEN WITH SOLID SURFACES AT ORBITAL ALTITUDES				84-034B-19	04/06/84	NORMAL	NA	86
GRIGSBY	SPACE-EXPOSED EXPERIMENT DEVELOPED FOR STUDENTS (SEEDS)				84-034B-63	04/06/84	NORMAL	NA	86
HICKEY	PASSIVE EXPOSURE OF EARTH RADIATION BUDGET EXPERIMENT COMPONENTS				84-034B-27	04/06/84	NORMAL	NA	86
HORZ	CHEMISTRY OF MICROMETEOROIDS				84-034B-51	04/06/84	NORMAL	NA	86
HUMES	SPACE DEBRIS IMPACT STUDY				84-034B-36	04/06/84	NORMAL	NA	87
JOHNSTON	FIBER OPTIC DATA TRANSMISSION EXPERIMENT				84-034B-03	04/06/84	NORMAL	NA	87
LARC STAFF	METEOROID DAMAGE TO SPACECRAFT				84-034B-61	04/06/84	NORMAL	NA	87
LIND	GROWTH OF CRYSTALS FROM SOLUTIONS IN LOW GRAVITY				84-034B-17	04/06/84	NORMAL	NA	87

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LIND	INTERSTELLAR GAS			84-034B-48	04/06/84	NORMAL	NA	87
MALHERBE	VACUUM-DEPOSITED OPTICAL COATINGS			84-034B-41	04/06/84	NORMAL	NA	87
MANDEVILLE	STUDY OF METEOROID IMPACT CRATERS ON VARIOUS MATERIALS			84-034B-32	04/06/84	NORMAL	NA	87
MANDEVILLE	ATTEMPT AT DUST DEBRIS COLLECTION WITH STACKED DETECTORS			84-034B-33	04/06/84	NORMAL	NA	88
MCDONNELL	MULTIPLE FOIL MICROABRASION PACKAGE			84-034B-31	04/06/84	NORMAL	NA	88
MCINTOSH	LOW-TEMPERATURE HEAT PIPE EXPERIMENT			84-034B-12	04/06/84	NORMAL	NA	88
MIRTICH, JR.	ION-BEAM-TEXTURED AND COATED SURFACES			84-034B-01	04/06/84	NORMAL	NA	88
MOREAU	RULED AND HOLOGRAPHIC GRATINGS			84-034B-42	04/06/84	NORMAL	NA	88
NICHOLS	EFFECTS OF SOLAR RADIATION ON GLASSES			84-034B-44	04/06/84	NORMAL	NA	88
O'SULLIVAN	HIGH RESOLUTION STUDY OF ULTRA HEAVY COSMIC RAYS			84-034B-49	04/06/84	NORMAL	NA	88
OWEN	TRANSVERSE FLAT PLATE HEAT PIPE PERFORMANCE			84-034B-37	04/06/84	NORMAL	NA	88
PAILLOUS	THERMAL CONTROL COATINGS EXPERIMENT			84-034B-34	04/06/84	NORMAL	NA	89
PARCELIER	EFFECT OF SPACE ENVIRONMENT ON COMPOSITE MATERIALS			84-034B-55	04/06/84	NORMAL	NA	89
POWELL	GRAPHITE-POLYMIDE AND GRAPHITE-EPOXY MECHANICAL PROPERTIES IN SPACE			84-034B-35	04/06/84	NORMAL	NA	89
PREUSS	CRITICAL SURFACE DEGRADATION EFFECTS ON COATINGS AND SOLAR CELLS			84-034B-46	04/06/84	NORMAL	NA	89
RICH	TRAPPED-PROTON ENERGY SPECTRUM DETERMINATION			84-034B-58	04/06/84	NORMAL	NA	89
ROBERTSON	EFFECT OF SPACE EXPOSURE ON PYROELECTRIC INFRARED DETECTORS			84-034B-18	04/06/84	NORMAL	NA	89
SCHALL	SPACE ENVIRONMENT EFFECTS ON SPACECRAFT MATERIALS			84-034B-15	04/06/84	NORMAL	NA	90
SCOTT, JR.	ATOMIC OXYGEN STIMULATED OUTGASSING			84-034B-07	04/06/84	NORMAL	NA	90
SEELEY	HIGH-PERFORMANCE INFRARED MULTILAYER FILTERS-RADIATION EFFECTS			84-034B-23	04/06/84	NORMAL	NA	90
SINGER	INTERPLANETARY DUST			84-034B-52	04/06/84	NORMAL	NA	90
SLEMP	EXPOSURE OF SPACECRAFT COATINGS			84-034B-05	04/06/84	NORMAL	NA	90
SLEMP	SPACE EXPOSURE OF COMPOSITE MATERIALS FOR LARGE SPACE STRUCTURES			84-034B-21	04/06/84	NORMAL	NA	90
TAYLOR	SPACE PLASMA HIGH-VOLTAGE DRAINAGE			84-034B-09	04/06/84	NORMAL	NA	90
TAYLOR	SPACE ENVIRONMENT EFFECTS ON FIBER OPTICS SYSTEMS			84-034B-16	04/06/84	NORMAL	NA	90
TENNYSON	PROPERTIES OF POLYMER-MATRIX COMPOSITE MATERIALS, EFFECT OF SPACE ENVIRONMENT			84-034B-24	04/06/84	NORMAL	NA	91
VENABLES	RADIATION SENSITIVITY OF QUARTZ CRYSTAL OSCILLATORS EXPERIMENT			84-034B-22	04/06/84	NORMAL	NA	91
WHITAKER	SOLAR-ARRAY MATERIALS (PASSIVE)			84-034B-45	04/06/84	NORMAL	NA	91
WILKES	THERMAL CONTROL SURFACES			84-034B-04	04/06/84	NORMAL	NA	91
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SPACE TEST PROGRAM P78-1	SEE STP P78-1							
SPACE TEST PROGRAM P80-1	SEE AFP-888							
SPACE TRANSPORT SYS-9	SEE STS 9/SPACELAB 1							
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BRUECKNER	HIGH RESOLUTION TELESCOPE AND SPECTROGRAPH (HRTS)			SPALAB2-10				173
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COWLES	INTERACTION OF OXYGEN AND GRAVITY INFLUENCED LIGNIFICATION			SPALAB2-02				173
FAZIO	SMALL, HELIUM-COOLED INFRARED TELESCOPE			SPALAB2-05				173
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FEREBEE	CHARGED PARTICLE				81-100B-03	02/00/82	NORMAL	STND	102
SMITHERS	HIGH FREQUENCY BEACON				81-100B-04	05/00/83	PARTIAL	STND	103
SWEETING	EARTH IMAGING				81-100B-02	01/00/82	NORMAL	STND	103
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KEPPLER	NEUTRAL MASS SPECTROMETER				84-128A-06	12/21/84	NORMAL	STND	109
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MOREELS	THREE-CHANNEL SPECTROMETER				84-128A-02	12/21/84	NORMAL	STND	109
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TYLER	RADIO SCIENCE TEAM			77-084A-02	09/06/77	NORMAL	STND	113
WARWICK	PLANETARY RADIO ASTRONOMY			77-084A-10	09/06/77	NORMAL	STND	113
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HANEL	INFRARED SPECTROSCOPY AND RADIOMETRY			77-076A-03	10/01/81	NORMAL	ZERO	114
KRIMIGIS	LOW-ENERGY CHARGED PARTICLE ANALYZER AND TELESCOPE			77-076A-07	09/06/77	NORMAL	STND	114
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SMITH	IMAGING			77-076A-01	09/06/77	NORMAL	STND	115
STONE	HIGH- AND MODERATELY LOW-ENERGY COSMIC-RAY TELESCOPE			77-076A-08	09/06/77	NORMAL	STND	115
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HOLT	LARGE AREA X-RAY PROPORTIONAL COUNTER			XTE -02				194
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XTE	SEE X-RAY TIMING EXPLORER							

5

INVESTIGATOR NAME INDEX

5. INVESTIGATOR NAME INDEX

This index contains an alphabetical listing of the names of the investigators associated with each experiment described in Sections 2 and 3. The current organizational affiliation of each investigator is also shown. Listed under each investigator's name are the experiments with which that investigator is associated. Each experiment entry contains the spacecraft (or Shuttle-attached payload) name, experiment name, NSSDC ID code, and the page number referencing the description of the experiment. An asterisk preceding an experiment name identifies the person as the principal investigator, lead investigator, or team leader for that experiment.

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APPENDIXES

C-4

APPENDIX A - OTHER RELEVANT SPACECRAFT

Spacecraft (including both free-flying spacecraft and Shuttle-attached payloads) relevant to the purpose of this report and not included elsewhere are listed in this appendix. Also listed here are missions which were planned to be launched during the reporting period but failed at launch. The listing includes those spacecraft that have been described in earlier reports of this series and now, for the first time, have a status of canceled, failed at launch, or mission being rescoped. (These spacecraft will not be listed in future reports of this series.) Also included are essentially passive spacecraft which are used to provide new science and technology information incorporating ground-based facilities and techniques. In this latter group are air density studies using air drag effects and ground-based photography, radio beacon reception studies, celestial mechanics studies using spacecraft motions and radio transmissions, and laser retroreflector studies. In addition, some spacecraft that were turned off but which are still operable may be listed, even though it may be unlikely that they will ever be re-activated. The spacecraft are listed alphabetically by NSSDC common name. Listed with each spacecraft are the sponsoring country and agency, the actual launch date, the NSSDC ID code, and the current status.

Spacecraft Name	Sponsoring Country and Agency		Launch Date	NSSDC ID	Current Status
ATS 5	United States	NASA-OSTA	08/12/69	69-069A	Mission Concluded
BE-B	United States	NASA-OSSA	10/10/64	64-064A	Laser Retroreflector
BE-C	United States	NASA-OSSA	04/29/65	65-032A	Laser Retroreflector
Diademe 1	United States	NASA-OSSA	02/08/67	67-011A	Laser Retroreflector
Diademe 2	United States	NASA-OSSA	02/15/67	67-014A	Laser Retroreflector
ECHO 1	United States	NASA-OSSA	08/12/60	60-009A	Laser Retroreflector
ECHO 2	United States	NASA-OSSA	01/25/64	64-004A	Laser Retroreflector
GEOS 1	United States	NASA-OSSA	11/06/65	65-089A	Laser Retroreflector
GEOS 2	United States	NASA-OSSA	01/11/68	68-002A	Laser Retroreflector
LAGEOS	United States	NASA-OSTA	05/04/76	76-039A	Laser Retroreflector
PAGEOS 1	United States	NASA-OSSA	06/24/66	66-056A	Laser Retroreflector
Pioneer 6	United States	NASA-OSSA	12/16/65	65-105A	Celestial Mechanics
Pioneer 7	United States	NASA-OSSA	08/17/66	66-075A	Celestial Mechanics
Pioneer 8	United States	NASA-OSSA	12/13/67	67-123A	Celestial Mechanics
Pioneer 9	United States	NASA-OSSA	11/08/68	68-100A	Celestial Mechanics
Seasat 1	United States	NASA-OSSA	06/27/78	78-064A	Laser Retroreflector
Starlette	France	CNES	02/06/75	75-010A	Laser Retroreflector
Venera 11	U.S.S.R.	SAS	09/09/78	78-084A	Inoperative 1/80
Venera 12	U.S.S.R.	SAS	09/14/78	78-086A	Inoperative 1/80

APPENDIX B - SPECIAL INVESTIGATORS AND GROUPS

B1. Astro Halley Science Team and Payload Specialists

The Astro Halley Science team and payload specialists are separately listed.

B2. Dynamics Explorer Guest Investigators

The names, affiliations, and investigations of the Dynamics Explorer Guest Investigators are listed.

B3. ERBE Experiment-NASA Investigators

The NASA-selected Earth Radiation Budget Experiment (ERBE) investigators and their affiliations are listed along with the subjects of their investigations.

B4. Galileo Imaging and Radio Science Investigators

The Galileo Orbiter imaging and radio science investigations include special individual studies. The individual investigators, investigator affiliations, study names, and objectives are listed.

B5. Joint IRAS Science Working Group

The Infrared Astronomy Satellite (IRAS), like IUE, does not have individual principal investigators or team leaders associated with each experiment. Members of the IRAS Science Working Team and their affiliations are listed.

B6. ISTP Theoretical Investigators

The International Solar Terrestrial Physics (ISTP) program theoretical investigators are listed along with their affiliations.

B7. ISTP Ground-Based Investigators

The International Solar Terrestrial Physics (ISTP) program ground-based investigators are listed along with their affiliations.

B8. Members of the SAX Consortium of Institutes

The members of the SAX Consortium of Institutes are listed.

B9. SOT Coordinated Filtergraph-Spectrometer Co-Investigators

The Solar Optical Telescope coordinated filtergraph-spectrometer co-investigators are listed here rather than in section 3.3 because of the large number of co-investigators for this experiment.

B10. ULYSSES Theoretical and Interdisciplinary Science Groups

The names and affiliations of the members of the International Solar Polar Mission (ISPM) theoretical and interdisciplinary science groups are listed.

B11. VRM Synthetic Aperture Radar Investigators

The names, titles, and investigations of the Venus Radar Mapper Synthetic Aperture Radar investigators are listed.

B1. ASTRO HALLEY SCIENCE TEAM AND PAYLOAD SPECIALISTS

Astro Halley Science Team:

M. F. A'Hearn	University of Maryland
J. C. Brandt	NASA-GSFC
A. D. Code	University of Wisconsin
B. Donn	NASA-GSFC
P. D. Feldman	Johns Hopkins University
B. L. Lutz	Lowell Observatory
M. B. Niedner	NASA-GSFC
C. R. O'Dell	Rice University
C. B. Opal	University of Texas at Austin
T. P. Stecher	NASA-GSFC
S. Wyckoff	Arizona State University

Astro Halley Payload Specialists:

S. Durrance	Johns Hopkins University
K. Nordsieck	University of Wisconsin
R. Parise	Computer Sciences Corporation

B2. DYNAMICS EXPLORER GUEST INVESTIGATORS

Guest Investigator & Affiliation	Investigation Title
V. J. Abreu Space Physics Research Laboratory Dept. of Atmospheric and Oceanic Science University of Michigan Ann Arbor, MI	Fabry-Perot Interferometer Studies of Nighttime OH
Syun-Ichi Akasofu Geophysical Institute University of Alaska Fairbanks, AK	Modelling of the Three-Dimensional Substorm Current System Using DE Auroral Images
Sunanda Basu Emmanuel College Physics Research Division Boston, MA	A Study of the Generation Mechanisms of High-Latitude and Equatorial F-region Irregularities Using DE-2 Data
Jeremiah C. Brackbill Los Alamos National Laboratory Los Alamos, NM	Investigation of Auroral Hiss
J. B. Cladis Lockheed Palo Alto Research Laboratory Palo Alto, CA	Transport in the Magnetosphere of Ions from the Polar Ionosphere
W. R. Coley Center for Space Sciences University of Texas at Dallas Richardson, TX	Studies of Dynamo Field Structure and Related Effects
Richard H. Comfort Dept. of Physics University of Alabama in Huntsville Huntsville, AL	Thermal Ion Heating in the Vicinity of the Plasmapause
A. Dalgarno Harvard College Observatory Cambridge, MA	Non-Thermal Oxygen Emission Profiles
Richard C. Elphic Institute of Geophysics and Planetary Physics University of California, Los Angeles Los Angeles, CA	A Study of Field-aligned Currents Observed at High and Low Altitudes in the Nightside Magnetosphere

Guest Investigator & Affiliation	Investigation Title
Mark J. Engebretson Augsburg College Minneapolis, MI	Studies of Thermospheric Atomic Nitrogen Obtained by the Neutral Atmosphere Composition Spectrometer (NACS) on Board the Dynamics Explorer-2 Satellite
J. D. Fix Dept. of Physics and Astronomy University of Iowa Iowa City, IA	A Proposal for Investigation of the Diffuse U. V. Background with Dynamics Explorer
F. A. Herrero Code 614 NASA/Goddard Space Flight Center Greenbelt, MD	Dynamics of the Earth's Thermosphere in Response to Auroral Energy Sources of Known Geometry and Time Variation
M. K. Hudson Space Sciences Laboratory University of California Berkeley, CA	An Investigation of Electrostatic Wave Generation and Ion Heating on Evening Auroral and Cusp Field Lines
J. R. Kan Geophysical Institute University of Alaska Fairbanks, AK	A Study of the Westward Traveling Surge
M. J. Keskinen Geophysical and Plasma Dynamics Branch Plasma Physics Division Naval Research Laboratory Washington, DC	Theoretical Studies of High Latitude Ionospheric Plasma Processes
Chin S. Lin Dept. of Space Sciences Instrumentation Research Division Southwest Research Institute San Antonio, TX	Investigation of Inverted-V Electron Acceleration Processes and their Altitude Distribution
Nathan J. Miller Code 614 Laboratory for Planetary Atmospheres NASA/Goddard Space Flight Center Greenbelt, MD	Stormtime Variations in Thermosphere-Plasmasphere Parameters

B2. continued

Guest Investigator & Affiliation	Investigation Title
T. Ondoh Space Physics Section, Radio Wave Division Radio Research Laboratories Ministry of Posts and Telecommunications Tokyo, Japan	Study of Wave-Particle Interactions with DE
Liu Qingling Institute of Space Physics Academia Sinica Peking, People's Republic of China	Investigations of the Origin of Plasma Hiss
Manfred H. Rees Geophysical Institute University of Alaska Fairbanks, AK	Auroral and Dayglow Modeling Using Dynamics Explorer Observations
Paul Rodriquez Space Plasma Diagnostics Group E. O. Hulburt Center for Space Research Naval Research Laboratory Washington, DC	Plasma Turbulence in the Polar Cusp
J. J. Sojka Center for Atmospheric and Space Sciences Utah State University Logan, UT	Global Dynamic Ionospheric Modeling Based Upon DE Observations
Richard R. Vondrak Lockheed Palo Alto Research Laboratory Palo Alto, CA	Simultaneous Measurements of Auroral Electrodynamics by the Chatanika Radar and the Dynamics Explorer Satellites
Benton J. Watkins Geophysical Institute University of Alaska Fairbanks, AK	Comparison of the DE Satellite Energetic Ion Mass Spectrometer and Incoherent-Scatter Radar Data
Dan Winske Los Alamos National Laboratory Los Alamos, NM	Investigation of Auroral Hiss
C. S. Wu Institute for Physical Science & Technology University of Maryland College Park, MD	Study of Z-Mode Radiation and AKR Based on DE-1 Observations

B2. concluded

Guest Investigator & Affiliation	Investigation Title
Wang Yuandian Institute of Space Physics Academia Sinica Peking, People's Republic of China	Investigations of the Origin of Plasma Hiss

B3. ERBE EXPERIMENT-NASA INVESTIGATORS

Principal Investigator	Affiliation	Description of Investigations
B. Barkstrom (ERBE Scientist and Science Team Leader)	NASA-LaRC	Instrument thermal modeling and cloud variability algorithm development
A. Berroir	Lab. de Meteorologie Dynamique/CNRS, France	Improvement of radiation modelizations in a general circulation model
R. Cess	State University of New York, Stonybrook	Validation of models which predict radiation budget variations and investigate climatic feedback effects.
R. Curran	NASA-GSFC	The effect of clouds on satellite albedo measurements
C. Duncan	NASA-GSFC	Calibration and evaluations of ERBE Sensors
A. Gruber	NOAA-NESDIS	Development of angular models and intercomparison of ERBE data with atmospheric constituents and operational satellite measurements
E. Harrison	NASA-LaRC	Studies of diurnal variation of cloudiness and earth radiation budget
D. Hartmann	Univ. of Washington, Seattle	Investigation of the diurnal cycle of radiation budget and the effects of cloudiness on net radiation
F. House	Drexel University, Philadelphia	Application of optimal estimation techniques to data use investigations
F. Huck	NASA-LaRC	Assessment of sensor performance and measurement accuracy

Principal Investigator	Affiliation	Descriptions of Investigations
G. Hunt	Imperial College London, England	Investigation of regional radiation budgets compared to those from geostationary data and use of HALOE and SAGE II data to understand effects of other atmospheric constituents
R. Kandel	Centre National de la Recherche Scientifique, France	Diurnal variations and the earth radiation measurements
M. King	NASA/GSFC	The effect of clouds on satellite albedo measurements
A. Mecherikunnel	NASA/GSFC	Calibration and evaluations of ERBE sensors
A. Miller	NOAA/National Meteorological Center	The dynamical interpretation of ERBE measurements
V. Ramanathan	National Center for Atmospheric Research	Use of ERBE measurements to validate and improve radiation models and general circulation climate models
E. Raschke	University of Cologne, Federal Republic of Germany	Investigation of surface and regional radiation budgets and improvement of model parameterizations
G. Smith	NASA/LaRC	Algorithm development and investigation of radiation budget variability
W. Smith	Univ. of Wisconsin, Madison	Investigation of time/space lag of radiation budget compared to other meteorological variables

B3. concluded

Principal Investigator	Affiliation	Descriptions of Investigations
T. Vonder Haar	Colorado State Univ., Fort Collins	Algorithm development for averaging ERBE data over time and space and synergistic investigations using SAGE II data

B4. GALILEO IMAGING AND RADIO SCIENCE INVESTIGATORS

Galileo Imaging Investigators

Investigation Name	Objectives	Investigator and Affiliation
Jovian Auroral Studies	To search for and investigate Jupiter's auroras; to use auroral imaging to obtain information on the configuration and dynamics of the Jovian magnetosphere; to search for luminous phenomena on the dark sides of the Galilean satellites	Clifford D. Anger University of Calgary, Canada
Structure and Dynamics of the Jovian Atmosphere	To investigate the physical structure and dynamical regimes of the Jovian atmosphere, including cloud motion, heat transfer, cloud composition and scattering properties, and atmospheric wave motions	Michael J. S. Belton Kitt Peak National Observatory
Geological Histories of the Galilean Satellites	To investigate the geologic histories of the Galilean satellites by photogeologic techniques to determine surface morphology and measure local elevations and height contours, and by the preparation of contour maps and geological maps	Michael H. Carr U.S. Geological Survey

B4. continued

Galileo Imaging Investigators

Investigation Name	Objectives	Investigator and Affiliation
Jovian Atmospheric Dynamics and Satellite Histories	To study dynamics of the upper atmosphere of Jupiter by determining cloud motions and evolution; to synthesize Galileo imagery with previous imagery, including ground-based patrol photography; to study surface histories of the Galilean satellites, particularly by crater density and morphology; and to investigate possibilities to make imaging studies of smaller Jovian satellites and of asteroid targets of opportunity	Clark R. Chapman Planetary Science Institute
Geodetics of the Galilean Satellites	To establish a geodetic net on the Galilean satellites and determine their radii, shapes, and rotational poles; to provide satellite control nets for precision cartography	Merton E. Davies Rand Corporation
Geological Exploration of the Galilean Satellites	To investigate the geology of the Galilean satellites using photogeological techniques, with emphasis on cratering, tectonic processes, and the discovery of new geological processes associated with the presence of icy crusts on the satellites	Ronald Greeley Arizona State University

Galileo Imaging Investigators

Investigation Name	Objectives	Investigator and Affiliation
Dynamical Properties of the Galilean Satellites	To study the internal structure and past history of the Galilean satellites from dynamical studies of shape and rotation; to investigate impact cratering and chronology; to search for previously undiscovered satellites in the Jovian system	Richard Greenberg Planetary Science Institute
Geology of the Galilean Satellites	To investigate surface morphology and infer geologic histories of the Galilean satellites, with emphasis on impact cratering processes and comparative studies with the terrestrial planets	James W. Head, III Brown University
Photogeology of the Galilean Satellites	To investigate the geology of the Galilean satellites with emphasis on impact cratering processes; to develop a multispectral image processing capability and imaging data library in Europe	Gerhard Neukum Munich University, Federal Republic of Germany
Photometry and Imaging of Jupiter and the Galilean Satellites	To investigate the Jovian atmosphere and cloud properties by multispectral photometry and polarimetry; to study surface composition of the Galilean satellites with emphasis on the role of volatiles; to search for auroral emissions from the interaction of satellite atmospheres with the Jovian magnetosphere	Carl B. Pilcher University of Hawaii

B4. continued

Galileo Imaging Investigators

Investigation Name	Objectives	Investigator and Affiliation
Jovian Atmospheric Circulation	To investigate the nature of the thermal and dynamical processes responsible for the atmospheric circulation of Jupiter and the ways that these processes are influenced by the structure of the cloud layers	Gerald Schubert University of California, Los Angeles
Imaging, Spectrophotometry, and Polarimetry of the Galilean Satellites and Jupiter	To investigate the surface morphology and spectrophotometric properties of the Galilean satellites; to identify compositional units of the satellites; to obtain photometry of Jovian belts and zones to investigate cloud properties and energy balance; to investigate possibilities for making photo-polarimetric observations of the smaller Jovian satellites	Joseph Veverka Cornell University
Multispectral Radiometric Imaging of Jupiter and the Galilean Satellites	To participate closely in the development of a multispectral radiometric imaging capability for Galileo, including design of the camera system, its calibration, and development of image processing software; to use these multispectral images to study compositional differences on the surfaces of the Galilean satellites and in the atmosphere of Jupiter	John B. Wellman Jet Propulsion Laboratory

Galileo Radio Science Investigators

Investigation Name	Objectives	Investigator and Affiliation
Celestial Mechanics Measurements of Jupiter and Its Satellites	To use closed-loop radiometric data from the Galileo orbiter (1) to determine the structure of the gravitational fields of Jupiter and the Galilean satellites; (2) to determine the relativistic time delay during the solar conjunction of Jupiter; and (3) to improve the determination of the orbits of Jupiter and its satellites. Also, to measure the general relativistic redshift in the gravitational field of Jupiter (by using one-way Doppler data)	John D. Anderson Jet Propulsion Laboratory
Atmospheres and Ionospheres of Jupiter and Its Satellites	To use S-X band occultation techniques to measure the vertical pressure and temperature profiles and atmospheric absorptivity on Jupiter, the Jovian ionospheric structure and dynamics, and the plasma environment of the Galilean satellites; to use phase and intensity scintillation data to study atmospheric turbulence and convection on Jupiter; and to investigate the use of bistatic radar techniques to study the surfaces of the Galilean satellites	Von R. Eshleman Stanford University

B4. continued

Galileo Radio Science Investigators

Investigation Name	Objectives	Investigator and Affiliation
Search for Gravitational Radiation	To use high-precision Doppler monitoring during cruise to conduct a systematic search for very low frequency gravitational waves incident on the solar system, to a level of strain amplitude of about 1.E-15	Frank B. Estabrook Jet Propulsion Laboratory
Jupiter Radio Astronomy	To study relativistic electrons in the Jovian magnetosphere by measuring the integrated radio flux near 400 MHz (using the Probe relay antenna) over a large range in time and geometry	Eric Gerard Meudon Observatory Paris, France
Microwave Investigation of Jupiter	To use the Probe relay antenna to study the trapped radiation belts of Jupiter and to measure the thermal microwave radiation from the planet with high spatial resolution. Also, to measure the thermal microwave brightness of the Galilean satellites in order to study their surface properties	Samuel Gulkis Jet Propulsion Laboratory

Galileo Radio Science Investigators

Investigation Name	Objectives	Investigator and Affiliation
Atmospheres and Ionospheres of Jupiter and Its Satellites	To use S-X band occultation techniques to study the atmospheres and ionospheres of Jupiter and the Galilean satellites, with emphasis on the neutral atmospheres. For Jupiter, the occultation data determine temperature, pressure, and density profiles down to the 100 mb pressure level. In addition, deviations of the local vertical direction from the predicted value will determined and used to study zonal wind velocities in the Jovian atmosphere	Arvydas J. Kliore Jet Propulsion Laboratory
Atmospheres and Ionospheres of Jupiter and Its Satellites	To use S-X band occultation techniques to study the atmospheres and ionospheres of Jupiter and the Galilean satellites, with emphasis on ionospheric measurements. In the ionosphere, the occultation data yield electron number density and plasma scale height profiles	Gunnar Lindal Jet Propulsion Laboratory
Radio Scintillation in the Jovian Atmosphere	To use spacecraft radio scintillations to measure and study turbulence in the Jovian atmosphere, and electron density irregularities, magnetic field direction, and winds in the Jovian ionosphere. Also, where possible, to take similar measurements of the Galilean satellites	Richard Woo Jet Propulsion Laboratory

B5. JOINT IRAS SCIENCE WORKING GROUP

Member	Affiliation
The Netherlands	
Baud, B.	University of Groningen
Beintema, D. A.	University of Groningen
Borgman, J.	University of Groningen
De Jong, T.	University of Amsterdam
Habing, H. J.	University of Leiden
Miley, G.	University of Leiden
Olnon, F. M.	University of Leiden
Pottasch, S. B.	University of Groningen
Raimond, E.	Radiosterrewacht
Wesselius, P. R.	University of Groningen
Van Duinen, R.	University of Groningen
United States	
Aumann, H. H.	NASA-Jet Propulsion Laboratory
Beichman, C. A.	NASA-Jet Propulsion Laboratory
Boggess, N.	NASA Headquarters
Gauthier, T. N., III	NASA-Jet Propulstion Laboratory
Gillette, F. C.	Kitt Peak National Observatory
Hauser, M.	NASA-Goddard Space Flight Center
Houck, J. R.	Cornell University
Low, F. J.	University of Arizona
Neugebauer, G.	California Institute of Technology
Soifer, B. T.	California Institute of Technology
Walker, R. G.	NASA-Ames Research Center
Young, E.	University of Arizona
United Kingdom	
Clegg, P. E.	Queen Mary College, London University
Emerson, J. P.	Queen Mary College, London University
Harris, S.	Queen Mary College, London University
Jennings, R. E.	University College, London University
Marsden, P.	University of Leeds
Rowin-Robinson, M.	Queen Mary College, London University

B6. ISTP THEORETICAL INVESTIGATORS

Member	Affiliation	Investigation
M. K. Hudson (PI)	Univ. of Calif., Berkeley	A Theoretical Study of Wave-Particle Interactions in the Earth's Neighborhood
M. A. Temerin	Univ. of Calif., Berkeley	
R. L. Lysak	Univ. of Calif., Berkeley	
C. A. Cattell	Univ. of Calif., Berkeley	
M. H. Rees (PI)	Univ. of Alaska	Modeling of the Atmosphere-Magnetosphere-Ionosphere System (MAMI)
R. G. Roble	National Center for Atmospheric Research	
C. P. Sonett (PI)	Univ. of Arizona	Theoretical Investigations
P. E. Krider	Univ. of Arizona	
L. L. Hood	Univ. of Arizona	
B. R. Lichtenstein	Univ. of Arizona	
F. Herbert	Univ. of Arizona	
K. Papadopoulos (PI)	Univ. of Maryland	Modeling and Theoretical Investigations
A. Hasegawa	Bell Laboratories	
J. B. McBride	Science Applications Inc.	
H. Okuda	Princeton Plasma Physics Laboratory	
P. J. Palmadesso	U.S. Navy Research Laboratory	
M. Ashour-Abdalla (PI)	Univ. of Calif., LA	The Development of Theoretical Technology for the OPEN Mission
P. J. Coleman, Jr.	Univ. of Calif., LA	
C. F. Kennel	Univ. of Calif., LA	
C. T. Russell	Univ. of Calif., LA	
R. J. Walker	Univ. of Calif., LA	
F. V. Coroniti	Univ. of Calif., LA	
J. M. Dawson	Univ. of Calif., LA	
V. Decyk	Univ. of Calif., LA	
R. W. Huff	Univ. of Calif., LA	
J. N. Leboeuf	Univ. of Calif., LA	
T. A. Lin	Univ. of Calif., LA	
L. A. Frank	Univ. of Iowa	
D. A. Gurnett	Univ. of Iowa	
T. Sato	Univ. of Tokyo	

B7. ISTP GROUND-BASED INVESTIGATORS

Member	Affiliation	Investigation
J. D. Kelley (PI) V. B. Wickwar	SRI International SRI International	High Latitude Incoherent-Scatter Radar Measurements
R. A. Greenwald (PI) R. D. Hunsucker J. G. Roederer T. B. Jones	Johns Hopkins University University of Alaska University of Alaska University of Leicester	Dual Auroral Radar Network (DARN)
M. J. Rycroft (PI) J. Dudeney D. Jones A. J. Smith	Natural Environment Research Council of the UK Natural Environment Research Council of the UK Natural Environment Research Council of the UK Natural Environment Research Council of the UK	OPEN Satellite Exploration Simultaneously with Antarctic Measurements (OPEN SESAME)
A. Vallance-Jones (PI)	National Research Council of Canada	Canadian Auroral Network for the OPEN Program Unified Study (CANOPUS)

B8. MEMBERS OF THE SAX CONSORTIUM OF INSTITUTES

Instituto per lo Studio delle Radiazioni Extraterrestri/CNR-Bologna

Instituto di Astrofisica Spaziale/CNR-Frascati

Instituto di Fisica Cosmica/CNR and Unita GIFCO-Milano

Instituto di Fisica Cosmica ed Informatica/ CNR and Unita GIFCO-Palermo

Instituto Astronomico-Universita di Roma

Cosmic Ray Working Group-Huygens Laboratorium-Leiden

Space Research Laboratory-Utrecht

Space Science Department of ESA-Noordwijk

B9. SOT COORDINATED FILTERGRAPH-SPECTROMETER CO-INVESTIGATORS

Member	Affiliation
R. R. Fisher O. R. White	High Altitude Observatory
J. W. Harvey W. L. Livingston R. W. Milkey	Kitt Peak National Observatory
L. W. Acton E. C. Bruner B. Haisch J. W. Leibacher H. E. Ramsey W. J. Rosenberg S. A. Schoolman R. C. Smithson T. D. Tarbel C. J. Wolfson	Lockheed Palo Alto
U. Anzer D. Galloway F. Meyer H. W. Schmidt H. Spruit R. Wegman	MPI-Physics Astrophysics
L. Cram R. B. Dunn B. Mihalas D. Mihalas J. B. Zirker	Sacramento Peak Observatory
J. Toomre	University of Colorado
J. T. Jefferies F. Orrall	University of Hawaii
S. Keil G. W. Simon S. P. Worden	USAF Geophysics Laboratory

B10. ULYSSES THEORETICAL AND INTERDISCIPLINARY SCIENCE GROUPS

Group Title	Member and Affiliation
Directional Discontinuities	Joseph Lemaire Institut d'Aeronomie Spatiale de Belgique, Brussels Michel Roth Institut d'Aeronomie Spatiale de Belgique, Brussels Marc Scherer Institut d'Aeronomie Spatiale de Belgique, Brussels Michael Schultz Aerospace Corporation, Los Angeles Roger Vanclooster Institut d'Aeronomie Spatiale de Belgique, Brussels
Mass Loss and Ion Composition	Giancarlo Noci Osservatorio Astrofisico di Arcetri, Florence Claudio Chiuderi Osservatorio Astrofisico di Arcetri, Florence Franca Chiuderi Drago Osservatorio Astrofisico di Arcetri, Florence Giannina Poletto Osservatorio Astrofisico di Arcetri, Florence
Interdisciplinary Support	W. Ian Axford Victoria University of Wellington, Wellington, New Zealand Cornelis de Jager Space Research Laboratory, Utrecht Carol Jordan University of Oxford
Advisory Members of Science Working Team	Aaron A. Barnes Ames Research Center John C. Brandt Goddard Space Flight Center Lennard A. Fisk University of New Hampshire Randy R. Jokipii University of Arizona Charles P. Sonett University of Arizona

B11. VRM SYNTHETIC APERTURE RADAR INVESTIGATORS

Investigator (Title)	Affiliation	Investigation
Pettengill, G. (PI)	Massachusetts Institute of Technology	Venus Radar Investigation
Arvidson, R. (CI)	Washington University	Stratigraphy
Baker, V. (CI)	University of Arizona	Geomorphic Studies
Binsack, J. (CI)	Massachusetts Institute of Technology	Systems Engineering
Campbell, D. (CI)	National Astronomy and Ionosphere Center	Surface Properties, Data Processing
Davies, M. (CI)	Rand Corporation	Geodetic Control
Elachi, O. (CI)	Jet Propulsion Laboratory	Systems Engineering
Guest, J. (CI)	University of London Observatory	Geologic Interpretation
Head, J. (CI)	Brown University	Geology and Geophysics
Kaula, W. (CI)	University of California, Los Angeles	Tectonics Style
Lambeck, K. (CI)	Australian National University	Interior Density Distribution
Leberl, F. (CI)	University of Graz	Radargrammetry
Masursky, H. (CI)	U. S. Geological Survey	Mission Operations
McDonald, H. (CI)	University of Arkansas	Morphology
McKenzie, D. (CI)	Cambridge University	Interior Density Distribution
Parsons, B. (CI)	Massachusetts Institute of Technology	Gravity-Topography Relationships
Phillips, R. (CI)	Southern Methodist University	Altimetry-Gravity Investigations
Raney, K. (CI)	Canada Center for Remote Sensing	System Engineering Radar Image Correlator
Saunders, R. (CI)	Jet Propulsion Laboratory	Surface Properties, Geology

Investigator (Title)	Affiliation	Investigation
Schaber, G. (CI)	U. S. Geological Survey	Geology-Structure
Schubert, G. (CI)	University of California, Los Angeles	Tectonic Processes
Soderblom, L. (CI)	U. S. Geological Survey	Data Processing
Solomon, S. (CI)	Massachusetts Institute of Technology	Geology-Geophysics
Stanley, R. (CI)	Wallops Flight Center	Altimetry Systems Engineering
Talwani, M. (CI)	Columbia University	Geophysical Analysis
Tyler, G. (CI)	Stanford University	Surface Maps from Radar
Wood, J. (CI)	Smithsonian Astrophysical Observatory	Geologic Synthesis

APPENDIX C - DEFINITIONS

Certain words and phrases are used in this report in a precise and specific sense. These terms are defined here to clarify the intended meaning.

ACTIVE	A spacecraft/experiment pertinent to this report that has been launched and was reported to NSSDC to have either a "normal" or "partial" status.
APOAPSIS	For heliocentric orbits, the distance from the center of the sun to the farthest orbit point, in astronomical units. For all other orbits, this means apoapsis altitude, the distance from the surface of the reference body to the farthest orbit point, in kilometers.
APPROVED MISSION	A spacecraft mission has been approved and funding is available for it.
BRIEF DESCRIPTION	A concise summary of the spacecraft mission, specifically outlining overall mission objectives and the scientific studies being performed. Also, a concise summary of experiment purposes and instrument characteristics, emphasizing those relevant to scientific use of the resulting data.
CANCELED MISSION	A mission was canceled and no funds are expected to become available to carry it out.
FAILED MISSION	A spacecraft failed to achieve a suitable orbit, or all of the experiments failed to function after achieving orbit.
INCLINATION	The angle (in degrees) between the satellite orbital plane and the equatorial plane of the primary gravitational body. For satellites with heliocentric orbits, the ecliptic plane is used in lieu of the equatorial plane.
INOPERABLE	A spacecraft/experiment can no longer produce useful scientific data because of malfunction or failure of the spacecraft/experiment systems or critical parts thereof; completion of the spacecraft trajectory in which useful measurements could be taken; or discontinuation of network support (tracking, command, and telemetry).
MISSION BEING RESCOPED	A mission has been redefined to an extent that the original mission plan and experiments are no longer valid and a new mission plan and experiments are under study.
NA	Status or data rate information not applicable.
NORMAL	Spacecraft/experiment systems are capable of working so that the data would be suitable for all planned scientific studies for the spacecraft/experiments when they are turned on and the data are acquired.

NSSDC ID CODE — An identification code used in the NSSDC information system. In this system, each successfully launched spacecraft/experiment is assigned a code based on the launch sequence of the spacecraft. Subsequent to 1962, this code (e.g., 72-012A for the spacecraft Pioneer 10) corresponds to the COSPAR international designation. The experiment codes are based on the spacecraft code. For example, the experiments carried aboard the spacecraft 73-019A (Pioneer 11) are numbered 73-019A-01, 73-019A-02, etc. Each prelaunch spacecraft and experiment is also assigned an NSSDC ID code based on the name of the spacecraft. For example, the approved NASA launch COBE would be coded COBE. The experiments to be carried aboard this spacecraft would be coded COBE -01, COBE -02, etc. Once a spacecraft is launched, its prelaunch designation is changed to a postlaunch one; e.g., the spacecraft common name of Pioneer G became Pioneer 11 at launch and its NSSDC ID code became 73-019A.

ORBIT TYPE — A word or phrase indicating the most important phase of the trajectory of a given spacecraft mission. The orbit type may be geocentric, selenocentric, heliocentric, Mercury orbiter, Venus orbiter, Mars orbiter, Jupiter orbiter, Saturn orbiter, lunar lander, Venus lander, Mars lander, Jupiter probe, Venus probe, lunar flyby, Venus flyby, Mars flyby, Mercury flyby, Jupiter flyby, or Saturn flyby. Other suitable types will be used as needed.

PARTIAL — Spacecraft/experiment systems are working, but not all are working as well as the design required. If the spacecraft/experiments were turned on and the data recorded, the data would be suitable for only a portion of the planned scientific studies.

PERIAPSIS — For heliocentric orbits, the distance from the center of the sun to the nearest orbit point, in astronomical units. For all other orbits, this means periapsis altitude, the distance from the surface of the reference body to the nearest orbit point, in kilometers.

PLANNED — The status given to a spacecraft mission which was either last reported to NSSDC as "approved" or which was reported as "proposed" and for which the experiments have been selected. This designation is also used for an experiment that is expected to fly on a planned spacecraft mission.

PROPOSED MISSION — Spacecraft design and experiments have been selected but funding has not been approved.

RETURNED TO EARTH — The status given to those experiments which have been carried onboard the Space Shuttle (but not deployed), which have performed successfully, and which have been returned to earth with the Shuttle.

STANDARD	Data that can be processed and made available to the experimenters are being acquired at the rate or percentage of coverage required to accomplish the planned studies.
SUBSTANDARD	Data that can be processed and made available to the experimenters are not being acquired at the rate or percentage of coverage required to accomplish all planned studies.
UNKNOWN	Information is either unknown or unavailable at NSSDC.
ZERO	Applied to data acquisition rates, indicates a spacecraft/experiment has been turned off except for state-of-health measurements and is in a standby condition capable of being returned to its previous status. In the case of Space Shuttle experiments, a zero data rate indicates that the experiment has been returned to earth by the Shuttle.

APPENDIX D - ABBREVIATIONS AND ACRONYMS USED BY NSSDC

A	angstrom; ampere
ac	alternating current
ACAD	academy
ACIC	Aeronautical Chart and Information Center (now Defense Mapping Agency Aerospace Center)
ACS	attitude control system
A/D	analog to digital
AE	Atmosphere Explorer (satellite, NASA)
AEC	Atomic Energy Commission (now part of Dept. of Energy, no longer called AEC)
AFB	Air Force Base
AFCRL	Air Force Cambridge Research Laboratories (now US Air Force Geophysics Laboratory)
AFGL	Air Force Geophysics Laboratory (AFSC)
AFO	Announcement of Flight Opportunity
AFSC	Air Force Systems Command
AGC	automatic gain control
AGCY	agency
A-h	amp-hour; ampere-hour
ALT	altitude
AM	amplitude modulation
a.m.	ante meridiem
AMPTE	Active Magnetospheric Particle Tracer Explorers (NASA satellite program)
AMS	Army Map Service (now Defense Mapping Agency Topographic Center)
AMSAT	Radio Amateur Satellite Corporation
amu	atomic mass unit (also see u)
AMU	astronaut maneuvering unit
Ap	magnetic activity index A_p
APL	Applied Physics Laboratory of Johns Hopkins University
APPL	application
APT	automatic picture transmission
ARC	Ames Research Center (NASA)
arc-min	arc-minute
arc-s	arc-second
ASCII	American standard code for information interchange
AT	atomic
atm	atmosphere
ATS	Applications Technology Satellite (NASA)
AU	astronomical unit
AUST	Australia
avg	average
AVHRR	advanced very high resolution radiometer
AWRE	Atomic Weapons Research Establishment (Australia)
AXAF	Advanced X-ray Astrophysics Facility (NASA)
b	barn; bar
B	bel; magnetic field strength
bcd	binary coded decimal
BCG	ballistocardiogram
BE	Beacon Explorer (satellite, NASA)

bpi	bits per inch
bps	bits per second
Btu	British thermal unit
BUV	backscatter ultraviolet
B/W	black and white
BWF	Bundesministerium fur Wissenschaftliche Forschung (Federal Republic of Germany)
C	degree Celsius; coulomb
C2	C_2
CaCO3	$CaCO_3$
cal	calorie
CAN	Canada; Canadian satellites
cc	cubic centimeter
CCD	charge-coupled device
CCE	Charge Composition Explorer (satellite, AMPTE program)
cd	candela
CD	crystal detector
CDA	command and data acquisition (station)
CDAW	Coordinated Data Analysis Workshop (NSSDC)
C&DH	control and data handling
CDHP	command and data handling package
CEM	channel electron multipliers
CENS	Centre d'Etudes Nucleaires de Saclay (France)
CEP	cylindrical electrostatic probe
CESR	Centre d'Etudes Spatial Rayonnement (France)
CFA	crossed electric and magnetic field analyzer
CG	center of gravity
CHEM	charge and energy mass spectrometer; chemical
CH4	CH_4
Ci	curie
CID	cathode imaging detector
Cl2	Cl_2
CMD	command
CNES	Centre National d'Etudes Spatiales (French space agency)
CNET	Centre National d'Etudes des Telecommunications (France)
CNRS	Centre National de la Recherche Scientifique (France)
COBE	Cosmic Background Explorer (satellite, NASA)
COMM	commission
CONIE	Comision Nacional de Investigacion del Espacio (Spain)
COS	Cosmic-Ray Satellite (ESA); cosmic
COSPAR	Committee on Space Research
CO2	CO_2
cp	candlepower
CPA	comprehensive particle analysis; curved plate analyzer
cpi	characters per inch
CPT	charged-particle telescope
CPU	central processing unit
CRA	Centro Ricerche Aerospaziali (Italy)
CRC	Communications Research Centre (Canada)
CRIE	cosmic-ray isotope experiment
CRIS	Centre de Rectification des Images Spatiales (CNES-IGN)
CRRES	Combined Release and Radiation Effects Satellite (joint NASA/USAF mission)

CRS	Commission for Space Research (Italy)
CRT	cathode ray tube
CTR	center
CZCS	coastal zone color scanner
d	day
DAN	Danish
DAPP	Defense Acquisition and Processing Program (DOD; now called DMSP)
DASA	Defense Atomic Support Agency (DOD)
dB	decibel
dBu	decibel unit
dc	direct current
DCP	data collection platform
DCS	direct couple system; data collection system
DCPLS	Data Collection and Platform Location System
DE	Dynamics Explorer (satellite, NASA)
DEF	defense
deg	degree
DFVLR	Deutsche Forschungs-und Versuchanstalt fur Luft-und Raumfahrt (Research Laboratory for Aeronautics and Astronautics, Federal Republic of Germany)
diam	diameter
DMA	Defense Mapping Agency (DOD)
DMSP	Defense Meteorological Satellite Program (DOD)
DOC-CRC	Department of Communications - Communications Research Centre (Canada)
DOD	Department of Defense
DPU	data processing unit
dr	dram
DRB-DRTE	Defence Research Board - Defence Research Telecommunications Establishment (Canada; now called Dept. of Communications - Communications Research Centre)
DSN	Deep Space Network (JPL)
DUS	data utilization stations
dyn	dyne
DYN	dynamic
E	energy; east; electric field strength
ECG	electrocardiograph
EDPS	Experiment Data and Power System
EDS	Environmental Data Service (NOAA)
EEA	Electrostatic Energy Analyzer
EEG	electroencephalogram
ELEC	electric
ELF	extremely low frequency
EML	Equatorial Magnetospheric Laboratory (ISTP spacecraft, now called EQUATOR)
EOF	end of file
EOS	Earth Observation Satellite (NASA)
EPAS	Electron Proton Angle Spectrometer
EPDS	Experiment Power and Data Systems
E/Q	energy per unit charge

E/S LIB PT	earth/sun libration point
ERBE	earth radiation budget experiment
ERBS	Earth Radiation Budget Satellite (NASA)
ERL	Environmental Research Laboratory (NOAA)
EROS	Earth Resources Observation System (Dept. of the Interior)
ESA	European Space Agency; electrostatic analyzer
ESA-GEOS	Geostationary Earth-Orbiting Satellite (ESA)
ESOC	European Space Operations Centre (ESA)
ESRO	European Space Research Organization (now ESA)
ESSA	Environmental Science Services Administration (now NOAA)
ESTEC	European Space Technology Centre (ESA)
ETR	Eastern Test Range (also referred to as Cape Canaveral; USAF)
EURECA	European Retrievable Carrier (spacecraft, ESA)
EUV	extreme ultraviolet
EUVE	Extreme Ultraviolet Explorer (satellite, NASA)
eV	electron volt
EVA	extravehicular activity
EXOS	Exospheric Satellite (Japan)
EXOSAT	European X-ray Observation Satellite (ESA)
F	farad; degree Fahrenheit
fc	footcandle
FIRAS	far infrared absolute spectrophotometer
fL	footlambert
FM	frequency modulation
FMDM	flex multiplexer/demultiplexer
FOC	faint object camera
FOF2	ordinary wave critical frequency for F_2 layer, f_oF_2
FOV	field of view
FPI	Fabry-Perot Interferometer
FRC	Flight Research Center (NASA)
FRG	Federal Republic of Germany
FSK	frequency shift keying
ft	foot (feet)
FWHM	full width at half maximum
g	gram
G	earth gravity; geometry factor; gauss
GAC	global area coverage
gal	gallon
GARP	Global Atmospheric Research Program
GAS	Get Away Special (Space Shuttle)
GEOPHYS	geophysical
GEOS	Geodetic Earth-Orbiting Satellite (NASA); Geostationary Earth-Orbiting Satellite (ESA)
GEOS 3	Geodynamics Experimental Ocean Satellite 3 (NASA)
GES FUR WELTRAUM-FORSCH	Gesellschaft fur Weltraumforschung (Center for Space Research, Federal Republic of Germany)
G.E.T.	ground elapsed time
GeV	gigaelectron volts (10^9 eV)
GHz	gigahertz

GISS	Goddard Institute for Space Studies (NASA)
GM	Geiger-Mueller
GMS	Geostationary Meteorological Satellite (Japan)
GMT	Greenwich mean time
GOES	Geostationary Operational Environmental Satellite (NASA-NOAA)
GPS	global positioning system
GRARR	Goddard range and range rate
GRM	Geopotential Research Mission (NASA)
GRO	Gamma-Ray Observatory (NASA)
GSE	geocentric solar ecliptic (coordinate system); ground support equipment
GSFC	Goddard Space Flight Center (NASA)
GSM	geocentric solar magnetospheric (coordinate system)
GSPC	gas scintillation proportional counter
GSTDN	ground spaceflight tracking and data network (GSFC)
GTL	Geomagnetic Tail Laboratory (ISTP spacecraft, now called GEOTAIL)
GUGMS	Glavnoye Upravleniye Gidrometeorologicheskoi Sluzhby (Main Administration of the Hydrometeorological Service, USSR)
GV	gigavolt
GVHRR	geosynchronous very high resolution radiometer
h	hour
H	henry
HAC	half-angle collimator
HCMM	Heat Capacity Mapping Mission (satellite, NASA)
HCO	Harvard College Observatory
HEAO	High-Energy Astrophysical Observatory (satellite, NASA)
HEPAD	high-energy proton alpha detector (or telescope)
HF	high frequency
HgI2	HgI_2
HILAT	High Latitude Satellite (DOD)
HNO3	HNO_3
H2	H_2
H2O	H_2O
H2O2	H_2O_2
HR	high resolution
HXIS	hard X-ray imaging spectrometer
HXRBS	hard X-ray burst spectrometer
Hz	hertz (cycles per second)
HZE	high-charge and high-energy particle
IAP	Institute of Atmospheric Physics (USSR)
ICSU	International Council of Scientific Unions
ID	identification
IDC	image dissector camera
IDM	ion drift meter
IGN	Institut Geographique National (France)
IGRF	International Geomagnetic Reference Field
IGY	International Geophysical Year
IKI	Institute for Space Research (USSR)
IMP	Interplanetary Monitoring Platform (satellite, NASA)
IMS	International Magnetospheric Study; ion mass spectrometer

in.	inch
INOP	inoperable
INSAT	Indian National Satellite (ISRO)
INST	institute
INTA	Instituto Nacional de Tecnica Aeroespacial (Spain)
ION COMP	ionospheric composition
IPA	Institute for Physics of the Atmosphere (SAS)
IPL	Interplanetary Physics Laboratory (ISTP spacecraft, now called WIND)
IPP	imaging photopolarimeter
IPS	instrument pointing system
IQSY	International Quiet Sun Year
IR	infrared
IRAS	Infrared Astronomical Satellite (The Netherlands-NASA-UK)
IRIG	Inter-Range Instrumentation Group
IRIS	infrared-interferometer spectrometer; Italian Research Interim Stage
IRM	Ion Release Module (AMPTE spacecraft)
IRR	infrared radiometry
ISAS	Institute of Space and Aeronautical Science (Japan)
ISEE	International Sun-Earth Explorer (spacecraft program, NASA-ESA)
ISIS	International Satellite for Ionospheric Studies (NASA-Canada)
ISPM	International Solar Polar Mission (ESA)
ISRO	Indian Space Research Organization
ISS	Ionospheric Sounding Satellite (Japan)
ISTP	International Solar Terrestrial Physics (NASA spacecraft study mission; formerly called OPEN)
ITOS	Improved TIROS Operational Satellite (NOAA)
ITSA	Institute for Telecommunication of Sciences and Aeronomy (formerly a subdivision of ESSA; now NOAA-ERL)
IUE	International Ultraviolet Explorer (satellite, NASA-UK-ESA)
IUS	intermediate upper stage
IUWDS	International URSIGRAM and World Days Service (WDC-A-R&S)
IZMIRAN	Institute of Terrestrial Magnetism and Aeronomy of the Academy of Sciences (USSR)

J	joule
JHU	Johns Hopkins University
JOP	Jupiter Orbiter Probe (Galileo Probe; NASA)
JPL	Jet Propulsion Laboratory (NASA)
JSC	Johnson Space Center (NASA)
Jy	jansky (10^{-26} W/sq m-Hz)

K	Kelvin
kbit	kilobit
kbs	kilobits per second
kbps	kilobits per second
keV	kiloelectron volt
kg	kilogram
kHz	kilohertz
kJ	kilojoule
km	kilometer
Kp	magnetic activity index K_p

KPNO	Kitt Peak National Observatory (NSF)
KSC	Kennedy Space Center (NASA)
l	liter
L	lambert
LAB	laboratory
LAC	local area coverage
LAGEOS	Laser Geodetic Earth-Orbiting Satellite (NASA)
LAMAR	large area modular array of reflectors
LAMMR	large antenna multifrequency microwave radiometer
LANL	Los Alamos National Laboratory (Dept. of Energy)
LaRC	Langley Research Center (NASA)
lb	pound
LDEF	Long-Duration Exposure Facility (NASA)
LED	light-emitting diode
LEE	low-energy electron
LEPA	low-energy plasma analyzer
LEPAT	low-energy proton alpha telescope
LEPEDEA	low-energy proton and electron differential energy analyzer
LeRC	Lewis Research Center (NASA)
LET	low-energy telescope; linear energy transfer
LF	light fine; low frequency
LFC	large format camera
LL	Lincoln Laboratory (MIT)
lm	lumen
LMD	Laboratory of Meteorological Dynamics
LMSC	Lockheed Missiles and Space Company
LP	Langmuir probe
LPSP	Laboratoire de Physique Stellaire et Planetaire (CNRS)
LR	labeled release; low resolution
LRIR	limb radiance inversion radiometer; low-resolution infrared radiometer
LS	light smoothed
lsb	least significant bit
LST	Large Space Telescope (spacecraft, NASA; later called Space Telescope, now called Hubble Space Telescope)
lx	lux
m	meter; milli- (prefix)
mA	milliangstrom; milliampere
MAG	magnetic field; magnetometer
MAPS	Measurement of Air Pollution from Satellite
MAS	Ministry of Aviation Supply (UK)
Mbit	megabit
MCC	Mission Control Center
M/Q	mass-to-charge ratio
MEA	materials experiment assembly
MED	medicine; medical
MEPED	medium energy proton and electron detector
MESA	miniature electrostatic accelerometer
Meteosat	European Geostationary Meteorological Satellite (ESA)
MeV	megaelectron volts
mg	milligram

MHz	megahertz
min	minute
MIT	Massachusetts Institute of Technology
MJS	Mariner Jupiter/Saturn (spacecraft, NASA)
mm	millimeter
MMS	Multimission Modular Spacecraft (NASA)
mol	mole
MPD	magneto-plasma dynamic
MPI	Max Planck Institute (Federal Republic of Germany)
MR	medium resolution
mrad	milliradian
msb	most significant bit
MSFC	Marshall Space Flight Center (NASA)
MSL	Material Science Laboratory (on Space Shuttle)
MUSE	monitor of ultraviolet solar energy
mV	millivolt
mW	milliwatt
Mx	maxwell
N	nucleon; north; newton
NA	not applicable; not available
NASA	National Aeronautics and Space Administration
NASC	National Aeronautics and Space Council
NASCOM	NASA Communications Network
NASDA	National Space Development Agency (Japan)
NATL	national
NATO	North Atlantic Treaty Organization
NBS	National Bureau of Standards
NCAR	National Center for Atmospheric Research (NSF)
NCC	National Climatic Center (now called National Climatic Data Center; NOAA)
NDRE	Norwegian Defense Research Establishment
NE	electron density, N_e
NESDIS	National Environmental Satellite, Data, and Information Service
NESS	National Environmental Satellite Service (now part of NESDIS, no longer called NESS)
NETH	Netherlands spacecraft
NHC	National Hurricane Center (NOAA)
NH3	NH_3
NI	ion density (concentration), N_i
NIH	National Institutes of Health (Dept. of Health and Human Services)
NLA	no longer affiliated
nm	nanometer
NMC	National Meteorological Center (NOAA)
NNSS	Navy Navigational Satellite System
NOAA	National Oceanic and Atmospheric Administration (formerly ESSA)
NORAD	North American Air Defense Command
NORW	Norwegian
NOS	National Ocean Survey (NOAA)
NO2	NO_2
NOTS	Naval Ordnance Test Station
NRC	National Research Council

NRL	Naval Research Laboratory
NSA	National Security Agency
NSF	National Science Foundation
NSSDC	National Space Science Data Center (NASA)
nT	nanotesla
N2	N_2
N2O	N_2O
NUCL	nuclear
NWL	Naval Weapons Laboratory
OBS	observatory
OMSF	Office of Manned Space Flight (no longer exists, now part of NASA Office of Space Flight)
ONERA	Office National d'Etudes et de Recherches Aerospatiales (France)
ONR	Office of Naval Research
OPEN	Origins of Plasmas in the Earth's Neighborhood (NASA program which no longer exists; its successor is ISTP)
OSCAR	Orbiting Satellite Carrying Amateur Radio
OSSA	Office of Space Science and Applications (NASA)
OSTA	Office of Space and Terrestrial Applications (no longer exists, now part of OSSA)
O2	O_2
O3	O_3
oz	ounce
P	poise
Pa	pascal
PAGEOS	Passive Geodetic Earth-Orbiting Satellite (NASA)
PAM	pulse amplitude modulation
PAM-A	payload assist module - emulates Agena upper stage
PAM-D	payload assist module - emulates Delta upper stage
PAM-D2	payload assist module - emulates Delta upper stage with additional boost
pc	parsec
PC	proportional counter
PCM	pulse-coded modulation
PDP	plasma diagnostic package; passive dosimeter packet
PFM	pulse frequency modulation
PHA	pulse height analyzer
PHYS	physics
PI	principal investigator
PICNO	picture number
pixel	picture element
pm	picometer
PM	pulse modulation; photomultiplier
p.m.	post meridiem
PMEL	Pacific Marine Environmental Laboratory (NOAA)
PMR	pressure modulation radiometer; Pacific Missile Range (USAF)
PMT	photomultiplier tube
P-N	positive-negative (junction)
POCC	Payloads Operations Control Center
PPL	Polar Plasma Laboratory (ISTP spacecraft, now called POLAR)

PPR	photopolarimeter radiometer
PPS	pulses per second
PRC	Peoples Republic of China
psia	pounds per square inch, absolute
psig	pounds per square inch, gauge
PSN/CNR	Piano Spaziale Nazionale/Consiglio Nazionale Delle Ricerche (Italy)
pt	pint
q	quart
Q	charge
rad	radian
RAD	radiation
RAHF	research animal holding facility
RAM	random access memory (system)
RAPSE	Report on Active and Planned Spacecraft and Experiments
RC	resistance capacitance product
RE	earth radii, R_E
REP	republic
RES	research
rf	radio frequency
rfI	radio frequency interference
rms	root mean square
RMS	remote manipulator system
ROSAT	Roentgen Satellite (German X-ray research satellite)
RPA	retarding potential analyzer
rpm	revolutions per minute
rps	revolutions per second
RRL	Radio Research Laboratories (Japan)
RSRS	Radio and Space Research Station (England)
RTD	Research Technology Division (USAF)
RTG	radioisotope thermoelectric generator
s	second
S	south; siemens
SAGE	Stratospheric Aerosol and Gas Experiment
SAMSO	Space and Missile Systems Organization (USAF; now called the Space Division)
SAO	Smithsonian Astrophysical Observatory (Smithsonian Institution)
SAR	synthetic aperture radar
SARSAT	Search and Rescue Satellite Aided Tracking
SAS	Soviet Academy of Science
SBUV/TOMS	solar backscatter ultraviolet/total ozone mapping spectrometer
S/C	spacecraft
SCATHA	Spacecraft Charging at High Altitudes (satellite; USAF)
SCI	science
SCR	selective chopper radiometer
SDPF	Sensor Data Processing Facility
SDSD	Satellite Data Services Division (NOAA)

SEA	spherical electrostatic analyzer
SEASAT	Ocean Dynamic Satellite (NASA)
SEC	secondary electron conduction (vidicon tube)
SEM	space environment monitor
SERC	Space and Engineering Research Council (UK)
SFA	sweep frequency analyzer
SHS	Soviet Hydrometeorological Service
SIDS	Space Investigations Documentation System (NASA; no longer exists)
SIG	selenide isotope generator
SIR-A	Shuttle Imaging Radar - A
SM	San Marco (satellite, Italian); also Italian Indian Ocean launch site
SME	Solar Mesosphere Explorer (satellite, NASA)
SMM	Solar Maximum Mission (satellite, NASA)
SMMR	scanning multispectral microwave radiometer
S/N	signal to noise
SNAP	systems for nuclear auxiliary power
SOT	Solar Optical Telescope (satellite, NASA)
SPAS	Shuttle Payload Satellite (deployable/retrievable German low-cost commercial spacecraft)
SPOT	Systeme Probatoire d'Observation de la Terre (satellite, CNES)
sq	square
sr	steradian
SRI	Stanford Research Institute
SRPA	spherical retarding potential analyzer
SRT	supporting research and technology
SS	Space Shuttle (NASA)
SSC	Satellite Situation Center (NSSDC)
SSCC	spin-scan cloudcover camera
SSD	Space Science Division (JPL)
SSLDEF	Space Shuttle Long-Duration Exposure Facility (NASA)
SST	satellite-to-satellite tracking
SSUS-A	solid spinning upper stage - emulates Atlas upper stage
SSUS-D	solid spinning upper stage - emulates Delta upper stage
St	stoke
ST	Space Telescope (satellite, NASA; now called Hubble Space Telescope)
STD	standard
STDN	Spaceflight Tracking and Data Network (NASA)
STP	Solar Terrestrial Probe (satellite, NASA); solar terrestrial physics; Space Test Program (DOD)
STS	Space Transportation System (NASA)
STS/SSUS	Spinning Upper Stage - launched from the STS
SW	southwest
SWG	Science Working Group
t	tonne (1000 kg)
T	tesla
TAC	Technology Application Center (USAF)
TBD	to be determined
TDRS	Tracking and Data Relay Satellite (NASA)
TDRS-MA	multiple access mode of operation with TDRS

TDRS-SA	single access mode of operation with TDRS
TDRSS	Tracking and Data Relay Satellite System (NASA)
TE	electron temperature, T_e
TEC	total electron content
TECH	technical; technology
TED	total energy detector
TEMP	temporal; temperature
TeV	tetraelectron volts (10^{12} eV)
THIR	temperature/humidity infrared radiometer
TIP	Tracking Impact Prediction (satellite, DOD)
TIROS	Television and Infrared Observations Satellite (NASA)
TL	team leader
TM	team member; thematic mapper
T/M	telemetry
TOF	time of flight
TOPEX	topography experiment - GEOS class spacecraft
TOPO	topographic
TOS	TIROS Operational Satellite (or System) (NASA)
TOVS	TIROS operational vertical sounder
TRF	technical reference file (NSSDC)
TSS	Tethered Satellite System (NASA-PSN/CNR)
TWERLE	tropical wind energy conversion and reference level experiment
u	atomic mass unit
U	university
UA	unified abstract
UARS	Upper Atmosphere Research Satellite (NASA)
UCLA	University of California at Los Angeles
UHF	ultra-high frequency
UK	United Kingdom
UKS	United Kingdom Spacecraft (AMPTE spacecraft)
ULEWAT	ultralow-energy wide-angle telescope
ULEZEQ	ultralow-energy, Z, E, and Q experiment
U.S.	United States
USA	United States of America
USAF	United States Air Force
USGS	United States Geological Survey
USN	United States Navy
USSR	Union of Soviet Socialist Republics
UT	universal time
UV	ultraviolet
V	volt
VAR	variation
VAS	VISSR atmospheric sounder
VCO	voltage-controlled oscillator
VDC	volts dc
VHF	very high frequency
VHRR	very high resolution radiometer
VIS	visible imaging spectrometer
VISSR	visible and infrared spin-scan radiometer

VLF	very low frequency
VLF/MF	very low frequency/multi frequency
VRM	Venus Radar Mapper (spacecraft, NASA)
vs	versus
W	watt; west
WATS	wind and temperature spectrometer
Wb	weber
WBM	wide-band module
WBVTR	wide-band video tape recorder
WDC	World Data Center
WDC-A-R&S	World Data Center A for Rockets and Satellites
WEFAX	weather facsimile
WFC	Wallops Flight Center (NASA); wave form channel
WFF	Wallops Flight Facility (NASA)
WMO	World Meteorological Organization
WSIR	wide swath imaging radar
WSMR	White Sands Missile Range
WTR	Western Test Range (also referred to as Vandenberg AFB; USAF)
WWW	World Weather Watch (WMO)
XTE	X-ray Timing Explorer (spacecraft, NASA)
XUV	extreme ultraviolet
yd	yard
yr	year
Z	atomic number